

**Effect of Non-Cognitive and Social Environmental Factors on the Retention of
Under-represented Minority Students in Engineering and Technology-Related
Disciplines.**

A Thesis

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by

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Dedications

This work is dedicated to my parents, Joseph Oscar Rocheleau and Anne Goyette Rocheleau, who inspired me to aim high, to work hard, and to give back; to my siblings Denise, Jeanne, Phoebe, Jay, David, Marie Anne, and Paul who along with their families, believed in and supported me; to Myles Thomas McDonald, who walked every step of this journey with me; and to the memory of George W. Cartwright, Drexel Vanguard Scholar, who with his courage, and faith, inspired all who knew him.

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Abstract**Non-Cognitive and Social Environmental Factors that Increase Retention of Under-Represented Minority College Students in Engineering and Technology-Related Disciplines**

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Frank A. Harvey, Ed.D.

The failure of American colleges and universities to retain African American, Hispanic and American Indian students in engineering and technology – related disciplines is a significant problem that poses a threat to America’s global technological leadership. The purpose of this study was to examine the non-cognitive and university-related social and environmental factors that under-represented minority college students enrolled in engineering and technology-related disciplines believed had contributed to their academic success and college retention.

Forty-nine current and former NACME Vanguard Scholars at the focus university were surveyed using an Internet-based research instrument and twelve participated in focus groups. The researcher-generated survey included the *Non-Cognitive Questionnaire (NCQ)*, and replicated the studies of William E. Sedlacek, Ph.D.

Results indicate that academic success and college retention could not be explained by background characteristics of race, gender, socioeconomic status, parental education, high school GPA and course pattern or SAT scores. Respondents credited non-cognitive abilities for their success and achieved above average scores on four non-cognitive ability scales. Campus support and advising programs were relevant to the development of non-cognitive abilities. In particular, cohort participation provided a micro-environment that strengthened and supported participants, enabling them to achieve the academic and social integration necessary for academic success and college retention.

CHAPTER ONE: INTRODUCTION & STATEMENT OF PROBLEM

Introduction

Prologue

In 1998, a student asked me a question at the core of this research: When he graduated from college, would he be middle class?

The questioner was a freshman African American and economically disadvantaged engineering student who had grown up in a large metropolitan area and had attended urban public schools. He had no financial or parental support, stated that he felt alone and afraid, was uncertain about the world that awaited him, and was academically under-prepared. The odds for his academic success were low; historically within the United States, fewer than 12% of all college graduates in science, technology, engineering and mathematics disciplines are African American, Hispanic or American Indian (NACME, 2003). Further, this student possessed few of the pre-college characteristics associated with college success: race, social class, academic preparation at the high school level, financial stability, or a supportive environment of family and friends.

Looking at this student's background, almost no one would have predicted that he would ever graduate from college. Yet his question wasn't whether or not he would graduate. He was a NACME Vanguard Scholar and he *expected* to graduate from college. His question was how being a college student would change him. I wondered how his selection as a Vanguard Scholar and his participation in the Vanguard Program would or could make a difference and alter the predicted course of events.

Years later, much has changed. The student who asked me that question is now approaching graduation and his question has become the wellspring of my research. Are

students pre-destined by personality or pre-college characteristics to succeed or fail, or can universities ‘tip the balance’ and increase the likelihood of academic success for educationally disadvantaged and under-represented students? Looking for answers to the students themselves, I have asked: What personal characteristics and campus-specific factors do Vanguard Scholars believe contribute to their persistence in engineering and technology-related majors at Drexel University?

Background

Over the past twenty-five years, one of the most intractable problems facing colleges of engineering, science, and technology has been the difficulty in recruiting and retaining women and under-represented minorities. The problem is two-fold: Not only are African-American, Hispanic and American Indian students admitted to college in far fewer numbers than they are represented in the general population, but once enrolled, their persistence and graduation rates are much lower than their majority student counterparts. According to the National Science Foundation:

Black and Hispanic students are less likely than white and Asian students to complete a bachelor’s degree within 5 years. Forty-eight percent of white students, 47% of Asian students, 34 percent of Black students, and 32 percent of Hispanic students who entered a bachelor’s degree program in 1989 had earned their degree by spring 1994. Thirty-seven percent of both Black and Hispanic students, compared with 27 percent of White students and 26 percent of Asian students, had earned no degree and were no

longer enrolled in a bachelor's program in 1994. (National Science Foundation, 2000, 1, p.9).

The problem is worse within science, technology, engineering and mathematics (STEM) disciplines that are the foundation of American's technological and economic future. According to a recent study by the Commission on Professionals in Science and Technology, African Americans, Hispanics and American Indians *together*, while comprising 24.5% of the total population, make up only 7.1% of the American science and engineering workforce (CPST, 2002; Adelman, 1999). If the United States is to remain technologically and economically competitive within the global economy, we will have to develop our Manpower resources across all racial, ethnic and economic sectors.

In 1994 the National Action Council for Minorities in Engineering (NACME) partnered with twelve universities across the country to create the *Engineering Vanguard Program* as a way of establishing a "pipeline" for under-represented students in engineering and technology-rich disciplines. Over the next eight years, almost three hundred Vanguard Scholars were enrolled nationwide. Although college retention rates for Vanguard Scholars varied by institution, all institutions had retention rates much higher than those for non-Vanguard students, under-represented students enrolled in STEM disciplines, and frequently, higher rates of retention than majority scholars attending the same institutions. According to recent correspondence from NACME, the retention rate for the Vanguard Program "continues to exceed the national average, which is 39% compared to 87% for the Engineering Vanguard Program" NACME (personal communication, January 6, 2004).

Why has the Vanguard Program succeeded so well? Did the students identified for the Vanguard program possess personality or pre-college characteristics positively correlated with college success? Did the university climate created on each campus in support of Vanguard Scholars enhance student achievement and satisfaction? Or, did student personality pre-college characteristics and university environment combine to enhance student success? If we could learn what factors positively contributed to the NACME Engineering Vanguard Scholars' academic and social success, it might be possible to implement more effective college recruitment and retention strategies and increase the number and percentage of under-represented students entering America's science and technology workforce.

This study examined the NACME Vanguard Program as it operated within a single institution (a private, comprehensive university with a strong reputation in engineering and technology) in an attempt to understand the non-cognitive personality factors, pre-college characteristics and campus-specific factors Vanguard Scholars believe allow them to overcome the odds and succeed in college majors of science, mathematics, engineering and technology (STEM) disciplines.

The NACME Engineering Vanguard Program

In 1996, Drexel University entered into a partnership with the National Action Council for Minorities in Engineering (NACME), as one of three university sites for the Engineering Vanguard Program. The Vanguard Program was a newly developed scholarship program with built in social and academic support services, to recruit, retain and graduate promising African American, Hispanic, American Indian and women students in engineering and technology (Campbell, 1996). According to the

Memorandum of Understanding signed by the President of Drexel university, and George Campbell, then President of NACME, “*Vanguard* is a model program that provides recruitment and comprehensive assessment of high school students at the beginning of their senior year, and academic enrichment, leadership development, and diversity training before and after matriculation, along with comprehensive scholarship support” (NACME, 1996, p.1).

Students were identified for admission to the Vanguard Program through referrals by mathematics, science and engineering faculty in urban school districts known to have large populations of African American, Hispanic and American Indian students: Houston, TX, New York, NY, Newark, NJ, Philadelphia, PA and Washington, DC. NACME qualified and selected scholars through the use of an assessment tool that measured problem-solving abilities and non-cognitive personality attributes in addition to the more traditional high school grades and SAT scores (NACME, 1997).

Because it gave equal weight to non-cognitive factors that previous research had shown to be positively associated with college success and to traditional admissions criteria such as SAT scores, the Vanguard program represented somewhat of a paradigm shift in procedures for admitting underrepresented minority students. However, the Vanguard Program was supported by NACME’s twenty-five years of experience in expanding the talent pool to create a pipeline of minority engineers, and by a well thought out theoretical framework. Students were selected in cadres through a non-traditional interactive assessment process, provided with full tuition and housing scholarships, given national leadership training and experience, and provided with intensive campus-based support services.

Between 1996 and 2003, the NACME Vanguard partnership expanded nationally to include a total of eight partner institutions located in five states and the District of Columbia, Drexel University (Pennsylvania), Lehigh University (Pennsylvania), Clarkson University (New York), Polytechnic University (New York), Rensselaer University (New York), Rochester Institute of Technology (New York), New Jersey Institute of Technology (New Jersey), the University of Colorado (Colorado) and Howard University (District of Columbia).

According to NACME, the 298 students selected nationally as Vanguard Scholars between 1996 and 2001 (the last year for which statistics are available), had the following racial/ethnic characteristics: 60.5% were African American (38.0% were males, 22.5% were females), 28.9% were Hispanic (19.5% were males, 9.4% were females), 1.0% were American Indian males, 6.1% were Asian (3.4% were males, 2.7% were females) and 3.0% were Caucasian (2.0% are males, and 1.0% are females). In addition, there was one female Pacific Islander scholar (NACME, 2002).

Although the program at Drexel University was proportionately larger as measured by the number of students enrolled and more successful, as measured by overall retention rate and number of graduates, the experiences of all university partners were similar. NACME Engineering Vanguard Scholars, although recruited from populations considered to be “at risk” because of a lack of the pre-college characteristics commonly associated with college retention, were retained at much higher levels than national norms.

The Drexel University Vanguard Program

Drexel University admitted its first cohort of ten Vanguard Scholars in 1996; the first seven Vanguard Scholars graduated in June 2001. Two students from the first cohort

transferred to other institutions following their freshman and sophomore years and earned B.S. degrees; another continues to pursue an undergraduate degree. Between 1996 and 2002, a total of one hundred and twenty students were admitted to the Drexel University as Vanguard Scholars. All one hundred and twenty scholars (100%) completed freshman year, and more than 90% have either graduated or are still currently working toward their undergraduate degree. A total of thirty-one Vanguard Scholars graduated between 2001 and 2003.

These retention rates compare extremely favorably to the retention rates for non-Vanguard minority students (see Table 1). Freshman to sophomore retention rates for students in STEM disciplines entering the university in 1999 was 82.9% (N= 176) for African American, Hispanic and American Indian students and 87.5% (N=1499) for majority students. In engineering, where the majority of Vanguard scholars are enrolled, retention rates were even lower: 78.7% for African Americans, and 75.0% for Hispanics (Drexel University, 2000). Further, since university statistics include minority Vanguard Scholars in their numbers, if these students were factored out, the actual retention rates would be even lower.

Of the first cohort of Vanguard scholars who entered the university in 1996, one has earned a master's degree, two have completed law school, one is attending medical school, five have graduated from college and are working in large corporations, and one is working in a technology-related field without having completed a degree. The average cumulative college GPA of these students was 2.92; the average SAT-total score was 1090, close to but below the university average total SAT total of 1122 (Drexel University, 2004).

Table 1:

A Comparison of Freshman-Sophomore Retention Rates for Vanguard and Non-Vanguard Scholars Entering College in 1999 at Drexel University.

	<u>Vanguard Scholars</u>	<u>Minority students</u>	<u>Majority students</u>
Science	100%	84.6% (26)	88.4% (250)
Engineering	100%	78.3% (60)	87.4% (410)
Info. Sci.	100%	100% (6)	95.9% (74)
Bio-Med	100%	80% (5)	89.5% (38)
TOTAL	100% (15)	81.41 (97)	90.9% (752)

Drexel University (2000a). *Report on Freshman-to-Sophomore year Retention, fall 1999*
Freshman Class. Office of Research & Graduate Studies (Unpublished).

Students recruited as Drexel Vanguard Scholars were admitted in cohorts of between 10 and 20 students per year, and provided with full tuition and housing scholarships for the length of their college education. In addition to the scholarship which is shared 85% by the university and 15% by NACME, Drexel provided Vanguard Scholars an array of academic and social support services designed to increase student retention. .

Between 1996 and 2002, only five students of a total of 86 enrolled had left the university prior to graduation: four African American males and one African American female. Eighty-one, or 94% of all Drexel Vanguard Scholars, were either currently enrolled in school or had graduated. This retention rate higher was not only higher than

that of other minority students at Drexel but was higher than the retention rate for all enrolled undergraduates (Drexel, 2000).

Drexel Vanguard Scholars closely mirror the racial and ethnic composition of NACME Vanguard Scholars as a whole, with the following distribution ($n = 86$): 52 (60.4%) are African American, 36 (41.8%) are African American males, 16 (18.6%) are African American females), 22 (25.6%) are Hispanic, 16 (18.6%) are Hispanic males, six (7.0%) are Hispanic females), seven (8.1%) are Asian, three (3.5%) are Asian males, four (4.7%) are Asian females, and four (4.7 %) are Caucasian, three (3.5%) are Caucasian males, one (1.2 %) is a Caucasian female. Table 2 compares the race and gender of Drexel Vanguard Scholars to that of the national pool of NACME Vanguard Scholars.

In addition to being predominantly from under-represented minority groups, most students enrolled as Vanguard Scholars have graduated from urban public schools, and have been good, though not exceptional, students with SAT scores below but close to the university average for any particular year. More than 90% of Drexel Vanguard Scholars are eligible for financial aid.

Table 2:

Comparison of Drexel Vanguard Scholars to NACME Vanguard Scholars

Drexel University Scholars (n=86)

NACME Vanguard Scholars (n= 298)

African American <i>n</i> = 52 (60.4%)	Males 36 (41.8%)	Females 16 (18.6%)	African American <i>n</i> = 180 (60.5%)	Males 113 (38%)	Females 67 (22.5%)
Hispanic <i>n</i> = 22 (25.6%)	Males 16 (18.6%)	Females 6 (7.0%)	Hispanic <i>n</i> = 86 (28.9%)	Males 58 (19.5%)	Females 28 (9.4%)
Asian <i>n</i> = 7 (8.1%)	Males 3 (3.5%)	Females 4 (4.7%)	Asian <i>n</i> = 18 (6.1%)	Males 10 (3.4%)	Females 8 (2.7%)
Caucasian <i>n</i> = 4 (4.7%)	Males 3 (3.5%)	Females 1 (1.2%)	Caucasian <i>n</i> = 9 (3%)	Males 6 (2%)	Females 3 (1%)
American Indian <i>n</i> = 0	Males	Females	American Indian <i>n</i> = 3 (1%)	Males 3 (1%)	Females
Pacific Islander <i>n</i> = 1	Males	Females 1 (1.2%)	Pacific Islander	Males	Females 1 (>1%)

Vanguard Program Elements

The Drexel University Vanguard Program is based on the philosophy that every student selected as a Vanguard Scholar can succeed in a STEM (Science, Technology, Engineering and Mathematics) majors and graduate from Drexel University as long as he or she makes a personal effort and makes use of the resources and opportunities for development and support that are made available. Interrelated components of the program include: a cohort educational experience, a pre-college summer program, scholarship support, a campus-based learning community, ethnically-based professional organizations, shared program values, study groups, holistic advising and counseling, academic support, cooperative education, faculty & administrative involvement, mentors, and family support.

Recruitment and Assessment

Vanguard Scholar recruitment for all participating universities is initiated by NACME, a national organization promoting African American, Hispanic and American Indian participation in engineering and science. In their senior year of high school interested students complete the NACME Assessment, a trademarked tool that assesses level of mathematical skill in addition to cognitive and non-cognitive abilities believed to contribute to college academic success. The names of students qualified by NACME as Vanguard Scholars are sent to partner universities, along with their gender and ethnicity, city of origin, high school and high school GPA, class rank and SAT or ACT scores. A university selection team compares the list to students who have been admitted to the university, and selects a cohort of between 10 and 20 students to be designated Vanguard Scholars.

Although no attempt was made through the scope of this research project to validate the NACME assessment process, it was an *a priori* hypothesis of the researcher that Vanguard Scholars share non-cognitive abilities, assessed through the NACME Assessment tool, that enable them to overcome academic and social barriers to college success.

Cohort Educational Experience

All Vanguard scholars were admitted to the university as members of both a national and local cohort of scholars. Each year, the NACME cohort of all participating Vanguard Scholars was intentionally crafted to include representative numbers of African Americans, Hispanics, American Indians, and women. During a shared experience called the *Summer Immersion* that is described below, individual students were able to bond with scholars from all participating universities. For each student selected as a Vanguard Scholar, participation in the *Summer Immersion* helped to underscore an understanding that they were participants in a national experience, and represented minority populations from across the United States. This cohort experience was reinforced through student participation in a series of twice-yearly NACME-sponsored student leadership seminars led by minority engineering professionals.

Following the *Summer Immersion*, the group of national Vanguard scholars was divided into university-specific cohorts. Each university developed its' own program for delivering support services to Vanguard Scholars. Drexel University Vanguard Scholars continued the cohort experience through their assignment to a single Vanguard advisor, through the requirement that freshman Vanguard scholars live together in a designated

dormitory, and through the availability of designated Vanguard housing for upper-class students.

Pre-College Summer Program

There is considerable support for the belief that participation in a pre-college program improves college retention (Boyd et al, 1995). During the summer prior to their freshman year, Vanguard Scholars participate in a pre-college program intended to strengthen their mathematics and science abilities and prepare them for the intense college learning experience that lies ahead. For the first five cohorts of Drexel Vanguard Scholars, this pre-college program was administered by NACME in the form of a two-week Summer Immersion for all Vanguard Scholars accepted for fall admission at any one of the partner universities. The Immersion was held on a college campus with NACME –selected faculty, and consisted of a rigorous academic ‘boot camp’ requiring intensive group work, and five to seven hours of homework per night. Participants were isolated from contact with non-participants to maximize the need to develop social and academic support networks among themselves. Seventy- six of the Drexel Vanguard Scholars completed the NACME Summer Immersion.

In spring, 2001, NACME shifted responsibility for the pre-college summer program to its partner universities. Thus, the pre-college summer program for the ten freshmen Vanguard Scholars in cohort six was held on Drexel’s campus, and integrated with the university’s summer bridge program for minority students. The program incorporated advanced mathematics and physics instruction, and offered training in study skills. The students had the opportunity to review some of the material they had learned in high school and to become familiar with some of the coursework they would take

during their first semester in college. In addition, the campus-based pre-college summer program provided students an opportunity to become acclimated to the college campus, and enabled them to participate in a range of social, recreational and cultural activities. For 2002 and 2003 this program was modified again in an attempt to model it more closely on the NACME Summer Immersion experience. It is not known whether the changes made in the pre-college summer experience impacted the college success of individual scholars.

Scholarship Support

All Vanguard Scholars receive full tuition and housing scholarships for the length of their college education. The philosophy behind this decision was a) to enable lowest income students to be able to attend college and 2) to reduce the need of students to work off-campus during school terms. Although at the beginning of the program, no academic standard was specified, the contract was later amended to include an academic performance requirement for continued scholarship support. Students admitted between 1996 and 2000 must make satisfactory progress toward a degree; students admitted in 2001 and beyond must maintain a 2.5 GPA.

Learning Community

Strong emphasis is placed on the Vanguard program as a learning community. Drexel Vanguard Scholars are admitted to the university as a part of a cohort, and are required to live in university housing with a Vanguard roommate during their freshman year. Beginning with the 2002-2003 academic year, freshman Vanguard Scholars reside in an intentional residential learning community with other high-performing students admitted with academic scholarship support. Beyond freshman year, Scholars are

strongly urged to remain on campus, living together in a dormitory designated for upper class housing. In addition, early in their freshman year, Scholars are presented with a pin, designating them as Vanguard Scholars. This is intended to foster a sense of pride and group cohesiveness within the group.

Program Values

The Vanguard Program was designed with a strong set of core values that inform the program, and that have been instilled in the students beginning with the Summer Immersion experience prior to college. These values include: striving for excellence, peer support, experiential learning through co-operative education, learning in groups, holistic advising that addresses the social as well as academic needs of students, the provision of undergraduate research opportunities, increased interaction with university faculty, staff and administration, a preparation for graduate study and a commitment to community service after graduation. It is important to note that the Vanguard Program is not built on a remediation mode; rather excellence is expected, and often achieved.

Faculty & Administrative Involvement

Deans, Vice Presidents, Department chairs and faculty participate in assessment activities, research mentorship, teaching and special events for Vanguard Scholars. Since the inception of the Vanguard program there has been frequent communication between NACME and university program staff to assure that student needs are being addressed and to maximize student retention.

Study Groups

Beginning with their experience in the summer program, all Vanguard Scholars are encouraged to learn and to study in groups, because it is believed that group learning

leads to increased content mastery, peer support, role modeling, and a sense of group belonging. Further, individual Vanguard scholars have been selected each year as peer leaders—first by NACME for assistance with the NACME summer immersion, and currently by Drexel University for its pre-college summer experience.

Holistic Advising & Counseling

Since the inception of the Vanguard program at Drexel University, a single individual has served as program director. At present, the program is administered by the Pennoni Honors College. The stated role of the Drexel Vanguard director is to eliminate every barrier to student success except the student's own hard work. College-based advisors provide academic advising. The role of the Vanguard director, in addition to program management and advocacy, is to address the needs of each scholar as an individual, and to address the personal, social, financial or career issues presented by students that impact their academic achievement and college success, to create research and cooperative education opportunities, and to provide sustained encouragement, support and recognition of their success.

Academic Support

Vanguard Scholars are encouraged to seek the help of tutors when needed. Tutoring often may be arranged with another Vanguard Scholar, or through the wider university. Tutoring services are available through the Center for Academic Excellence, a university support program for minority students and through the Drexel Center for Learning and Instruction (DCLI). In addition, students who belong to professional associations such as NSBE (National Society of Black Engineers), SHPE (Society of

Hispanic Professional Engineers), and SWE (Society of Women Engineers) have access to the peer mentoring and tutoring services provided for student members.

Cooperative Education

Drexel University is nationally recognized as a cooperative education institution. As such, 84% of Drexel university undergraduates complete three six-month long cooperative education assignments that are either paid work or research internships (Drexel, 2002). The intention of cooperative education is to provide students with an experiential learning base to complement the theoretical learning achieved through on-campus classes. Every effort is made to place Vanguard scholars into internships where they will be mentored and supervised by minority professionals in engineering, mathematics, technology and science. Although not a formal part of the Vanguard Program, cooperative education shapes the culture of the university and the learning experiences of all Vanguard Scholars.

Mentors

Mentors for Vanguard Scholars are recruited from minority and majority university faculty and administration, coop employers, and from Vanguard alumni and upper-class students. Many of these individuals serve as mentors, role models, and advisors and as a support network for Vanguard Scholars.

Family Support

The parents of Vanguard Scholars are an important part of the support network created to assure their college success. Within established FERPA (Federal Education Right to Privacy Act) regulations, parents are encouraged to contact the director of the Vanguard program before their initial enrollment and throughout their son or daughter's

time at the university, to discuss issues they believe may be impacting their son or daughter's success on campus. Personal meetings are arranged whenever possible. This has resulted in the creation of strong personal ties between university personnel and the students' families. This has been particularly significant in the recruitment of Hispanic and American Indian students: With the admission of the 2002-2003 Vanguard cohort, the program includes four sets of siblings, and four sets of cousins.

Participation in Student Organizations

In 1997, Drexel Vanguard Scholars created a campus- recognized student organization: SANS (Society for the Advancement of NACME Scholars). The group sponsors trips, lectures and leadership opportunities, and provides a forum for scholars to meet each other. Funding for the organization is provided through an allocation from student activity fees. In addition, Vanguard Scholars are encouraged to actively participate in SHPE (Society for Hispanic Professional Engineers), NSBE (National Society of Black Engineers), or SWE (Society of Women Engineers).

These program components are intended to work together to create a strong foundation to address the academic, social and emotional needs of Vanguard Scholars, and to link them to the university community. The program has been highly successful in recruiting and retaining increased numbers of under-represented minority students in science, mathematics, engineering and science as determined by the students' cumulative college GPA and by their persistence in STEM majors and retention to graduation.

Program Achievements

According to evaluation reports submitted to NACME, Drexel Vanguard Scholars have achieved the following:

1. The persistence rate of the 86 Vanguard Scholars admitted between 1996 and 2001 was 93% in the sciences and engineering at Drexel University.
2. Thirty-three of forty students (82.5%) enrolled in the first three cohorts (2001-2003) graduated within five years. Two students (5.0%) from these cohorts are currently enrolled and continue to make progress toward a degree.
3. From 1996-2001 Vanguard Scholars maintained a mean cumulative GPA of 2.98.
4. For a distribution of all Vanguard Scholars among majors, and the corresponding retention rate for each major, see Table 3.

Table 3:

Retention Rate of Vanguard Scholars by College and Major

College of Engineering: 63 Students (74%)						
Department	Number of Students	Males		Females		Retention
Chemical Engineering	10	8	5 African American 3 Hispanic	2	1 Pacific Islander 1 Asian	100%
Civil & Architectural	11	7	4 African American 1 Hispanic 1 Asian 1 Other	4	2 African American 1 Hispanic 1 Other	91%
Electrical & Computer Engineering	23	14	11 African American 2 Hispanics 1 Asian	9	6 African American 2 Hispanic 1 Asian	96%
Material Engineering	1			1	1 Hispanic	100%
Mecanical Engineering and Mechanics	18	14	10 African American 3 Hispanic 1 Other	4	3 African American 1 Hispanic	72%
College of Engineering Retention Rate						88%
School of Bio-Medical Engineering & Health Professions: 7 Students (8%)						
Bio-Medical Engineering	7	2	1 African American 1 Hispanic	5	2 African American 1 Hispanic 2 Asian	100%
School of Bio-Medical Eng. & Health Professions Retention Rate						100%
School of Environmental Engineering and Policy: 3 Students (3%)						
SESEP	3	2	1 African American 1 Other	1	1 African American	100%
School of Environmental Engineering and Policy Retention Rate						100%

Table 3 (continued)

College of Arts & Sciences: 6 Students (7%)						
Department	Number of Students	Males		Females		Retention
Computer Science	5	5	1 African American 3 Hispanic 1 Asian			80%
Mathematics	1	1	1 Hispanic			100%
College of Arts & Sciences Retention Rate:						83%

College of Information Science & Technology: 3 Students (4%)						
Department	Number of Students	Males		Females		Retention
Information Science & Technology	3	3	3 African American			100%
College of Information Science & Technology Retention Rate						100%

Bennett LeBow College of Business & Administration: 4 Students (5%)						
Department	Number of Students	Males		Females		Retention
Commerce & Engineering	4	4	2 African American 2 Hispanic			100%
Bennett LeBow College of Business & Administration Retention Rate						100%

TOTAL DREXEL VANGUARD RETENTION RATE:	93%
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Drexel University (2000d) unpublished.

Drexel University and the Philadelphia Urban Setting

Drexel University is located in Philadelphia, Pennsylvania, a large urban metropolis with a population of 1.5 million. According to Year 2000 Census figures provided by the City of Philadelphia Planning Commission, population within the City of Philadelphia is distributed as follows: 45% White, 43.2% African American, 8.49% Hispanic and 4.5% Asian. An additional seven percent of the population defines itself as multi-racial (City of Philadelphia Planning Commission, 2002).

Established in 1891, Drexel University defines itself as a “technological university” with an undergraduate population of approximately 11,500 full and part time students. Seven colleges offer undergraduate degrees: the College of Arts & Science, the College of Engineering, LeBow College of Business, College of Information, Science and Technology, College of Media Arts & Design, the College of Nursing, and the Richard C. Goodwin College of Evening & Professional Studies. In addition, two schools also provide undergraduate degrees: the School of Education and the School of Bio-Medical Engineering, Science and Policy. More than 80% of Drexel’s undergraduate students reside on or near its campus, located in the University City section of Philadelphia.

A defining feature of Drexel University is its identity as a cooperative education institution. As such, more than 90% of all Drexel University undergraduate students participate in one to three “co-op’s”: a series of six-month long paid internships closely related to the student’s undergraduate major.

On July 1, 2002, Drexel University merged with MCP Hahnemann University, a university which itself resulted from the combination of the Medical College of

Philadelphia (originally Medical College for Women), and Hahnemann University in 1993. MCP Hahnemann University included the largest private medical school within the U.S., a college of nursing and health professions, and a school of public health. As a result of the merger, Drexel University is now composed of eleven colleges and schools, and has 13,000 undergraduate and 3,000 graduate students in attendance.

Problem Statement

What non-cognitive abilities, pre-college characteristics, and campus-specific factors are perceived by Vanguard Scholars as contributing to their persistence in college and academic success in engineering and technology-related disciplines? What can an understanding of the success of the Vanguard Program contribute to our understanding of why and under what circumstances women and underrepresented minority students persist in engineering and technology-related disciplines?

Questions Guiding the Study

A guiding assumption of the researcher was that the interaction of non-cognitive abilities, pre-college characteristics and social-environmental factors specific to the Drexel University campus had contributed to the higher than expected retention of Drexel Vanguard Scholars. It was believed that:

1. The assessment process utilized by NACME identified non-cognitive personality factors shared by Vanguard Scholars that helped them achieve personal and academic success.
2. Scholars did not uniformly possess pre-college characteristics associated with college success.

3. Program services provided by the university helped to attach them both to their academic major and to the university as a whole, therefore increasing their probability of college retention.

Research Questions

1. How much importance do students ascribe to such pre-college factors as race and gender, parental education, socio-economic status, high school preparation, and standardized test scores? How do Vanguard scholars explain their ability to persist despite the lack of traditional pre-college factors positively associated with college success?
2. What are the non-cognitive abilities shared by Vanguard scholars and how might these make them more likely to persist in college in engineering and technology-related disciplines?
3. What do Drexel Vanguard Scholars perceive as the campus-specific social-environmental factors that contribute to the high graduation rates of students in the program? How much importance do students ascribe to such factors as financial support, a cohort learning experience, shared residential living, participation in campus-related activities, co-op, faculty involvement, scholar advising, research opportunities, social support, campus environment, and academic assistance? How do these factors relate to academic persistence and increased graduation rates?

Significance of the Study

An understanding of the individual and campus-specific factors that compensate for the lack of pre-college factors linked to academic success and college retention is a

subject with national significance and interest. The results of this study will have applicability not only to the eight universities that served as Vanguard program partners, but to each one of the more than 300 colleges of engineering within the United States that struggle with the retention of under-represented minority students. It is hoped that as a result of this study, universities across the country will subject their own campus environments to rigorous examination, with the result that all students, minority or majority, will find their choice of university to be welcoming and supportive.

Definition of Terms

Within the context of this study, a number of terms will be used in the discussion of student retention. The following definitions will provide uniformity and a common understanding of the terms that appear throughout the study:

Administrative Exempt staff: Employees may be faculty members or “exempt personnel, but have a university appointment type that includes such positions as vice president, director, dean or department head.

Attrition: The process of leaving an academic institution of higher learning prior to the completion of a degree. Attrition refers to the sum of transfer, stopout, and dropout students.

Cohort: A cohort is a group of incoming freshman students that are intentionally grouped together in a common living and/or academic setting in the attempt to build a cohesive social unit (Tinto, 1996)

Dropout: An individual who has permanently left a college or university prior to completion of a degree without intending to complete that degree at that or any other similar institution.

Graduate: An individual who has been awarded an undergraduate degree from an accredited institution of higher education.

Under-Represented Minority Student: An individual who is either an American citizen or permanent resident and who defines himself or herself as belonging to one or more of the following racial/ethnic groups: African American, American Indian, Pacific Islander or Hispanic.

Persistence: The completion of a full year of study as a full-time registered student in an institution of higher education.

Retention: The completion of all years of study in a single institution terminating in the awarding of an undergraduate degree.

Stopout: An individual who has temporarily left a college or university with the intention of returning at a later date to complete a degree program.

Student: An individual who is enrolled in a program leading to a degree within an accredited institution of higher education. A full-time student is an enrolled individual who is taking 12 or more credits per term. A part-time student is an enrolled student taking fewer than 12 credits per term.

Transfer In: An individual who began his or her college career at another institution, and who has enrolled at Drexel University with the goal of completing an undergraduate degree program.

Transfer Out: An individual who has permanently left the institution under study and who has enrolled in a second university with the intention of completing a degree program.

Under-Represented Minority Group: A minority population (see above) whose participation in a field or domain as a percentage is less than the percentage of that group within the United States population as a whole.

Vanguard Scholar: A student selected by NACME, Inc. for participation in the Engineering Vanguard Program and enrolled at Drexel University and other partner institutions between 1996 and 2002.

Assumptions & Disclosure

The reality of the NACME Vanguard Program at Drexel University lies in the experiences individual scholars who currently attend or have attended Drexel University. Through this research study I hope to give voice to the students to convey, in their own words, how the Vanguard Program has impacted their lives and contributed to their individual college success within the demanding fields of engineering and technology-related disciplines.

It is important to disclose that I have served as director of the Vanguard program at Drexel University since its inception. As director I have served as NACME liaison and as advisor to Drexel University's Vanguard Scholars. Although my status as Vanguard advisor afforded me great access to Drexel's Vanguard Scholars, it brought special challenges in the design of this research project because in order to understand all aspects of the program—its weaknesses, as well as its strengths, open and honest opinions would be needed. In developing the methodology for this study I believe that I was successful in creating a neutral research environment and that, as a result, both the research process and the data derived from this study are both reliable and valid.

At the same time, however, it is important to disclose that I remain an active proponent of the Vanguard program within the university. I believe that the Vanguard Program incorporates program elements that can be effectively utilized with other target populations to increase both the academic and social attachment to universities; thus having a positive impact on student retention.

This was conducted with the knowledge and approval of John B. Slaughter, Ph.D., president of the National Action Council of Minorities in Engineering (NACME), who supported the need for research on the Vanguard program. With NACME's support, I was given access to a wealth of individual and aggregate data about Vanguard Scholars: race and ethnicity, city of origin, high school, high school class rank, SAT: math and verbal scores, family composition and the educational attainment of both parents. For Vanguard Scholars at Drexel University, this information was compared with major, cumulative and individual term GPA, number of credits completed and graduation data. In addition, and most importantly, I am grateful for the support and participation of Drexel's Vanguard Scholars, who are the primary subjects of this research study.

Throughout this study it was my intention that the language of the research be both informal and personal, using where possible, the actual words of Vanguard Scholars to describe their experiences in the program and the impact that these experiences have had on their lives.

Overview of the Chapters

In addition to this introduction and overview, the dissertation consists of the following four chapters:

Chapter 2: Review of the literature and presentation of the major research findings in three areas: (a) demographic data regarding the college attendance and persistence of African American and Hispanic Americans, (b) theoretical models of student retention and persistence, and (c) a comparison of the Vanguard Program to other well-known student retention programs.

Chapter 3: A description of the research paradigm, research methodology, study site, population studied, instrumentation and data analysis procedures.

Chapter 4: Results of the Study including the statistical analysis of responses to closed-ended questions in the survey, and an informal analysis of the qualitative data gathered through the open-ended questions and the focus group interviews

Chapter 5: Discussion and Recommendations, including an interpretation of the findings, a discussion of the most salient issues for the retention of under-represented minority students in engineering and technology-related disciplines, and recommendations for future research and practice.

CHAPTER TWO: REVIEW OF THE LITERATURE

Retention/Attrition in American Higher Education

The following review of literature and research provides an overview of the issue of undergraduate student retention in the United States. The first section provides a synthesis of what is known about the persistence and degree attainment for minority students, primarily African American and Hispanic, in undergraduate majors of science, mathematics, engineering and technology. The second section, briefly examines the models of student retention that have shaped both research and college intervention models. The third section provides an overview of pre-college factors that have been found to have a positive impact on student retention, particularly for African American and/or Hispanic students. Lastly, the fourth section focuses on programs, similar to the Vanguard program under study, that have demonstrated success in improving the persistence and retention rates of minority students in science, mathematics, engineering and technology majors.

Persistence and Degree Attainment of Minority Students

According to recent data from the National Science Board (AAAS, 2004, NSB, 2000), and the Commission of Professionals in Science and Technology (CPST, 2002), the traditional pool of college graduates from which American scientists and engineers are drawn is changing rapidly. The population of White, non-Hispanics, is declining, while the population of minorities--African American, Asian and Hispanics is increasing (CPST, 1999; CPST, 2000; CPST 2002; May, 2001; NSB, 2000). However, the participation rate in the science and engineering workforce of African Americans,

Hispanic Americans, and American Indians remains underrepresented in science and engineering relative to their numbers (AAAS, 2004; May, 2001). See Table 4.

Table 4:

Evidence of Minority Under-participation in U. S. Science and Engineering Workforce

	Percentage U.S. Population 1999	Percentage Total Workforce 1999	Percentage S&E Workforce 1999
White men	35.2	39.9	63.2
White women	36.7	34.8	18.6
Asian men	1.8	2	8.4
Asian women	2	1.8	2.6
Black men	5.7	4.9	2.1
Black women	6.4	5.9	1.3
Hispanic men	5.8	5.9	2.4
Hispanic women	5.7	4.2	1
American Indian men	0.4	N.A.	0.2
American Indian women	0.4	N.A.	0.1
Persons with Disabilities	~20	N.A.	N.A.

Source: CPST (2004), data derived from NSF, SESTAT and U.S. Census Bureau, Current Population Survey, March 1999, and NSB, 2002.

Presented at AAAS: The Impact of U.S. Supreme Court on Affirmative Action, January 2004

Note: Totals may not add to 100 due to rounding.

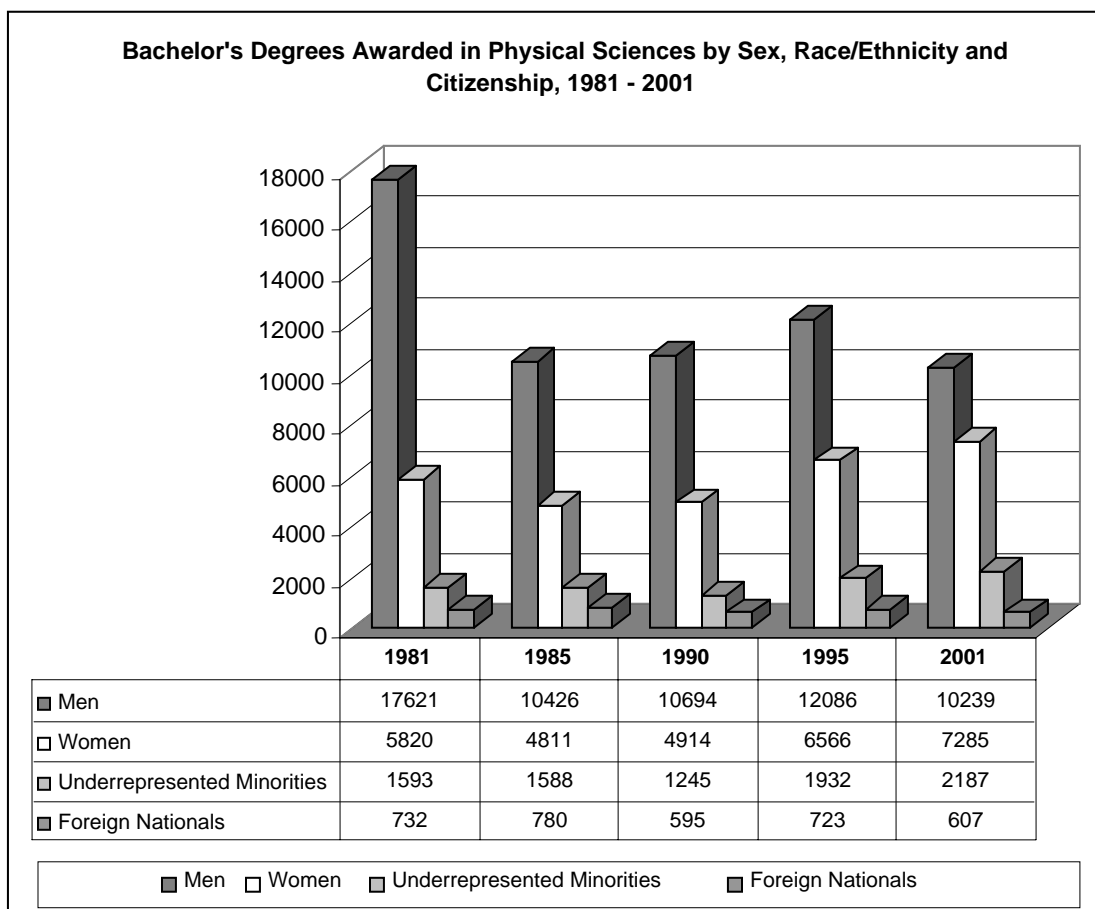
Although the number of doctoral degrees awarded in science and engineering disciplines between 1975 and 1995 to Asians increased from approximately 750 to more than 3700, the number of Ph.D.'s awarded to Blacks during the same time period remained almost constant, increasing from approximately 350 to a little more than 500 (AAAS, 2004). According to the 1993 National Study of Postsecondary Faculty, in 1992 African Americans comprised only 2.8% of full-time engineering instructional faculty and staff; Hispanics fared slightly better at 3.1% and American Indian/Alaskan Natives

were less than one percent” (U.S. Department of Education, 1998, Table 232). If America is to retain its technological expertise, and leadership in the world economy, we must find ways of increasing the participation of traditionally underrepresented populations in college, and in those science, mathematics, engineering and technology majors that are expected to be the foundation of future technological discovery and economic growth.

According to the CPST, the number of underrepresented minorities enrolled as full-time first year students in engineering declined by 5% overall from 1992 to 1996 (CPST, 1999). Between 1991 and 1996 African American enrollment fell by 16%; Hispanic enrollment dropped by 3% (May, 2001; Morrison, C. et al. 1995; Chubin & Babco, 2003). Compounding this drop in enrollment is the fact that African Americans, Hispanics and American Indians do not advance to successive stages of degree preparation in the same proportion as do White and Asian students (CPST, 1999; May, 2003; NSB, 2000; AAAS, 1996; National Science Foundation, 2000; Tapia, R., Chubin, D., & Lanius, C., 2000; Castellanos, J. & Jones, 2003).

Table 5:

Bachelor's Degrees Awarded in Physical Sciences by Sex, Race/Ethnicity and Citizenship, 1981-2001.



Source: CPST (2004), data derived from National Science Foundation

African Americans

African Americans are the largest racial minority population in the United States, comprising 12.9% of the total population. Moreover, their numbers continue to increase at rates far greater than their White counterparts. School-aged African Americans (5-24) are increasing at rates more than double that of the majority population. With these increases, by the mid-point of the 21st century, African Americans will comprise fewer

than 16% of the American population, with White Americans comprising 74% of the total (CPST, 1999; U.S. Census Bureau, 2004). However, the participation of African Americans in higher education, and in the technologically advanced careers for which a science, engineering, or technology degree is a pre-requisite, is not proportional to their numbers in society, and is at a rate that is lower than that of their majority counterparts. Only 10% of current freshman engineering students are African American and 7% are Hispanic (NSB, 2000). This may be because African Americans and other ethnic minorities have fewer of the characteristics associated with college success: high social and economic status, college educated parents, and a sound high school preparation, including rigorous mathematics and science courses (NSF, 2000).

In 1992, sixty-seven percent of African Americans, twenty- five years or older, had earned a high school diploma. Although this represented a 17% increase over the previous ten years, it still lagged far behind the academic achievement of White Americans, who, for the same aged population had a high school graduation rate of 87.1% (CPST, 1999).

While the improved high school graduation rate reflected an increased number of African Americans considered eligible for admission to college, the picture was less positive with regard to college attendance in general and high school preparation for science and engineering. Along with Hispanic Americans and American Indians, African Americans take fewer higher -level mathematics and science courses in high school, and score lower on standardized high school mathematics achievement tests (Malcolm & Anderson, 2000; U.S. Department of Education, 1995 (b)). “At present, 20 percent of white and 33 percent of Asian American students score at or above NAEP (National

Assessment of Educational Progress) proficiency levels, compared to 4 percent of African American Students, 6 percent of Hispanic students, and 3 percent of American Indian students” (Campbell, P., Jolly, E., Hoey, L, & Perlman, L., 2002, p. 4). Lower mathematics and science proficiency levels result in lower scores on standardized tests used for college admissions.

In 1998, African Americans had a total average SAT score of 860 (Math 426; Verbal 434), more than 100 points lower than the average SAT score of 1054 (Math 528; Verbal 526) for white students (CPST, 1999). Since emerging research indicates that to be successful in engineering a student requires a minimum mathematics SAT score of 525 (NACME, 2002 a), relatively few African Americans are able to secure admission to top engineering schools. In addition, perhaps anticipating the social challenges at predominately white universities, almost one-third of all African American engineering students attended Historically Black Colleges and Universities (HBCUs) (NSF, 2000).

In a study of college student retention, being admitted is but the first part of the equation. The second part is persisting through an average 4.9 years of college and attaining a baccalaureate degree. While African Americans constitute almost 12 percent of entering freshman college students, and almost 10 percent of first –year engineering students they comprise only eight percent of all recipients of bachelors degrees (Newman & Newman, 1999), and five percent of engineering graduates (Campbell et al, 2000; NSB, 2000). Stated in other terms, over a five- year period, which is normal for all college students enrolled in four- year programs, only 45 percent of African American students admitted to college will have earned a bachelor’s degree as compared to a 57 percent graduation rate for white students (Chenoweth, K., 1999; NSF, 2000). “ In 2000,

among U.S. citizens and permanent residents, African Americans earned 8.3% of all science and engineering bachelor's degrees, Hispanics earned 7.2%, and Native Americans earned 0.7%” (CPST, 2002, p. 53). Table 5 shows the relative rates of degree completion for White, African American and Hispanic college students six years after high school:

Table 6:

Rates of Degree Completion Six Years after High School among Students who Entered College by 1986

<u>Category</u>	<u>% Going to College</u>	<u>BA/BS Degree</u>
Total	70.8	26.5
White	71.4	29.1
African American	68.3	14.8
Hispanic	61.4	11.0

Source of data: Tinto (1993, p. 29).

Table 5 shows that African American and Hispanic college students have a college completion rate less than 50% of the college completion of White college students six years after high school.

Hispanic/Latino Americans

Hispanic Americans are the fastest growing population in the United States, and are expected to comprise 25% of the total U.S. population by the year 2050 (U.S. Census Bureau, 2004). During the 1980's, through a combination of immigration and higher birth rates the population of Hispanic Americans grew seven times the rate of White, Non-Hispanics. As a result, the average age of Hispanic Americans is more than

10 years younger than that of the total U.S. population, a fact that is expected to have a large impact upon the composition of American schools, kindergarten through college (CPST, 2000; U. S. Census Bureau, 2004).

While generally classified as a single population, Hispanic Americans include individuals with very different cultural roots. Hispanic Americans may have origins in Mexico, Puerto Rico, Cuba, Dominican Republic, El Salvador, Nicaragua, Guatemala, Spain, or the countries of South America. Mexican Americans, the majority of Vanguard Scholars classified as Hispanic, also comprise the largest group of Hispanic Americans, 63.3% of the total population (CPST, 2000). “Because the within-group differences can shape the way students experience the college environment, the practice of aggregating all Latinos into one category ‘may distort research results related to Hispanic college students’” (Arbona & Novy, 1991, p. 335 as cited in Hernandez, J. C., 1999, p.7). Unfortunately, because the total population of Hispanic college students remains small, disaggregated demographic data is rarely available for Hispanic subpopulations, and there are few studies that compare the academic performance of different Hispanic populations.

Although Hispanic Americans have made great progress over the past ten years, their educational attainment and thus, their ability to contribute to America’s technological and economic supremacy, continues to lag behind other American ethnic groups. Rodriguez (2000) states that Hispanics “are the most segregated ethnic/racial group in the nation” (p.3), and ascribes attendance at ethnically segregated, inadequately funded schools to poor achievement, high secondary school attrition, and poor preparation for college (Rodriguez, 2000). As a result, many Hispanic families remain economically disadvantaged, reducing their ability to financially support college attendance, even when a

student's high school academic achievements might make it possible (NSF, 1996).

According to the Educational Testing Service, if Hispanic Americans had the same education and commensurate earnings as whites, the earnings of Hispanic men would increase by 71 percent; Hispanic Women by 34% (Carnevale & Fry, 2000).

In 1998, the most recent year for which data is available, almost 30 % of Hispanic Americans between the ages of 15 and 24 were high school dropouts (National Center for Education Statistics, 1997). Only 55.4% of all Hispanic Americans aged 25 or older had earned high school diplomas, as compared to 83.7% of White Americans (CPST, 2000; NSF, 2000). Thus, fewer than 50% of Hispanic Americans were even considered eligible for higher education. This is evident in the finding in 1998, that among Americans age 25-29 who had completed high school, 18% of Blacks and 16% of Hispanics had earned a college degree (B.S. or higher). According to *The Chronicle of Higher Education* (2003), "Among native-born Hispanic young people, approximately only 15 percent finish a bachelor's degree today" (Chronicle of Higher Education, 11/28/03, B6). This compares to a college degree attainment rate of 34% for White Americans (NSF, 2000).

The educational attrition of Hispanic Americans continues through college, particularly in STEM disciplines. Although Hispanic Americans comprise 9.4% of all college freshmen, they earn only 5.5 % of total engineering degrees awarded (Campbell, Jolly, Hoey, and Perlman, 2002; NSB, 2000). Because Latinos are particularly underrepresented in the most sought-after fields such as engineering and computer and information sciences, they continue to be shut out from career opportunities that arise from America's technological supremacy (Chronicle of Higher Education, 2003). "Latinos

receive 6% of all bachelor's degrees, but only 4% of master's degrees and 3% of doctoral degrees (Chronicle of Higher Education, 2003, p. B6).

The Importance of Pre-College Characteristics

Many studies have demonstrated a relationship between student pre-college characteristics and college success. For all students, pre-college characteristics that have a positive impact on college retention in science, technology, engineering and mathematics (STEM) disciplines include (a) a positive high-school GPA which is recognized as being the best overall predictor of college success (Astin, 1993; Tinto, 1993; Ting, 1998; Schwartz & Washington, 2002); (b) the successful completion of higher level mathematics and science courses (Campbell, Denes, & Morrison, 2001); (c) socioeconomic status (Bowen & Bok, 1998; Tinto, 1993), which has been shown to impact African Americans more than it impacts white students, and (d) family educational level (McGrath & Braunstein, 1997; NSF, 2000). In addition to the above factors, for minority students, the presence of family and peer support for educational goals is an important factor in predicting student success (Fries-Britt, 1994; 1997; Gonzalez, 1997; Maras, 2000). Some of the pre-college factors to be considered are described in the following sections:

Level of Ability

Although it would appear self-evident, level of intellectual ability impacts an individual's likelihood of achieving academic success and college persistence. For majority students, entering ability is positively correlated with academic success (Astin, 1977; Pike, Schroeder & Berry, 1997). "Highly able students are much more likely than their less able peers to get involved academically, to participate in honors programs, to

get high grades, to complete college (and) to graduate with honors” (Astin, 1978, p. 217).

However, for minority students, the picture is less clear, and there is some evidence to suggest that high ability African-American students are less likely to complete college than are African-American students with lower SAT scores (Bowen & Bok, 1998, p. 380).

Gender

In general, being female is positively correlated with college success. Being female appears to contribute to an individual’s ability to garner emotional support from significant others, which, in turn, may contribute to academic and social integration, and indirectly to academic success and college persistence (Astin, 1978; Tinto, 1975; Pike, Schroeder & Berry, 1997). This may be related to the ability of women to better utilize non-cognitive abilities that will be discussed later in this study.

Ethnicity

There is a large amount of research supporting the assertion that White and Asian students are much more likely to achieve college success and persist in college than are African-American, Hispanic and American Indian students (Astin, 1993). As reported by Tinto (1993), White students are almost twice as likely complete college as are Black or Hispanic students. One explanation that has been advanced for the impact of race/ethnicity on college persistence is that being African American, Hispanic or American Indian appears to have a negative effect on an individual’s ability to achieve both academic and social integration within predominately White academic environments (Astin, 1978; Tinto, 1975; Pike, Schroeder & Berry, 1997, B). Failure to achieve academic and social integration impact’s an individual’s level of commitment to

academic goals and subsequent academic achievement, and these, in turn, impact college retention (Pike, Schroeder & Berry, 1997).

Socio-Economic Status

Family socio-economic status has been shown to have a direct correlation with college attendance and retention (Bowen & Bok, 1998; Tinto, 1993) with both a direct and indirect impact. At the most basic level, students from poor families are unable to afford college, and even students of high ability from poor families fail to enroll (Bowen & Bok, 1998; Perna, L. 2000). Even with federal financial aid and loans, there is a large gap between available funding and the cost of education; The only way an individual may be able to afford college is to attend part-time, or to work long hours while attending college. However, because part-time status and off-campus student employment negatively impact an individual's ability to achieve either academic or social integration, both of these strategies have been demonstrated to work against a student's ability to succeed academically and persist in college (Tinto, 1993; Pike, Schroeder & Berry, 1997; Perna, 2000).

On an indirect level, low socio-economic status may have an even more devastating impact by limiting an individual's pre-college experiences—and ability to acquire the cultural capital measured in standardized tests; in short, lack of family income may negatively impact children's ability to participate in experiences that prepare them for the academic rigor and the social experience of college (Harrell and Forney, 2003).

Level of Parental Education

For all students, college attendance and retention increase proportionally with increased parental educational level (NSF, 2000). Parental educational level appears to

impact the college attendance and academic success of children in a myriad of ways. At one level, the presence of positive parental role models who have provided for their children and led happy and fulfilled lives without having gone to college provides a powerful message to their children that a college degree is not necessarily needed job and personal satisfaction. However, the opposite is also true. Cardoza (1991) found that Hispanic women who were most likely to complete college were those whose own mothers had a college degree.

Parental educational level also helps determine a family's socio-economic status and access to resources such as quality of neighborhood, quality of the local educational system, and perhaps as important, heuristic knowledge about selecting and funding higher education.

High School GPA and Course Pattern

For all students, including African Americans and Hispanics, high school GPA is the single best predictor of college success (Astin, 1993; Tinto, 1993; Ting, 1998). As reported in Schwartz and Washington, 2000, "Bontekoe's (1992) study of 477 freshmen found a stronger correlation between high school GPA and college GPA, than between the American College Admissions Test (ACT) scores and college GPA, indicating that high school GPA may be a more valid predictor than ACT composite scores (p. 355).

There is also strong support for the belief that a rigorous high school course pattern in which students gain mastery over difficult subjects contributes to the development of an academic identity and the confidence needed to succeed in college (Newman & Newman, 1999).

Parental and Peer Support

The support of family and friends is one of the best predictors of college success both because of fear of disappointing individuals who are important to us as well as positive affirmation of academic self-concept. In a study of students living in residential learning communities, Pike, Schroeder and Berry found that “the most important predictor of...students’ persistence was the support they received from friends and family” (2000, p. 618).

SAT Scores as Predictors of College Success

Although universally used in undergraduate college admissions, SAT scores taken by themselves are generally considered poor predictors of college success, and have been criticized both for under-predicting college achievement (Lawlor, Richman & Richman, 1997; Ting & Bryant, 2001), and for over-predicting it (Bowen & Bok, 1998); House & Keeley, 1997; Hunter & Samter, 1998; Moller-Wong, Shelley & Ebbers, 1999; Zwick, 1999). Critics generally state a distinction between the higher predictive value of the SAT for freshman year grades of White students than for minority students. Moller-Wong, Shelley & Ebbers (1999) found that rather than predicting success, the very highest ACT composite scores (34-36) were a strong predictor of attrition. Fleming and Morning conducted a meta-analysis of studies assessing the predictive value for student success of SAT scores and found that, on average in thirteen studies, SAT scores predicted 12% of the variance in grades among white students; however, in eight studies, SAT scores predicted only 9% of the variance among African Americans in white schools and in eight studies, 5% of the variance in college grades among Latino students was predicted by the SAT (Fleming & Morning, 1998). In a study of academically at risk students Ting

found the SAT to be “ineffective in forecasting first-generation and low-income students performance in the first year” (Ting, S., 1998, p. 19). This supports the assertion that the SAT is a poor predictor of college grades for all students, but is worse for Latinos and African Americans.

Although SAT scores have some success in predicting freshman year grades, studies show the lack of a strong correlation between SAT scores and college graduation for any population (Sedlacek, 1991; Fleming & Garcia, 1998; Lawlor, Richman & Richman, 1997; Ting & Bryant, 2001). In a study of graduating seniors at Wake Forest University, Lawlor, Richman and Richman (1997) found “strong evidence”, that while the high school class rank and high school GPA of black and white students as well as their cumulative college GPA’s at graduation did not differ, “statistically significant SAT score differences were observed between black and white students” (Lawlor, Richman & Richman, 1997, p.3). This led the authors to conclude that the SAT-T “should not be considered a viable predictor of the success”, and that “if SAT scores were used to predict college graduation GPA, Black college student GPA’s would be underestimated” (Lawlor, Richman & Richman, 1997, p. 3).

Although each characteristic previously discussed can individually impact a student’s likelihood of college admission and retention, these characteristics are generally found in clusters, and appear to take on proportionally more weight as they are grouped together. Thus, race and ethnicity are related to level of parental education and family socio-economic status, which in turn affect quality and rigor of the high school experience, level of career aspirations, and standardized test scores.

Because African American, Hispanic and American Indian students generally lack the pre-college characteristics associated with academic success and college retention, they have been included, by definition among the population of college students traditionally considered to be *at risk* (of college failure or attrition) (Zea et. al., 1997). Although there are many definitions of *at risk*, the one used within this study is that of Perez (1998) who defined the *at risk* student as “one who possesses academic, social, and economic problems that challenge his or her success in college” (p.1). By this definition, all but two Vanguard scholars, both Caucasian, can be considered *at risk* students.

Models of Student Retention

The results of both college-specific and longitudinal research over the past twenty five years (Astin, 1993; Bean, 1980; Carbrera & Castaneda, 1993; Carbrera, Castaneda, Nora & Hengstler, 1992; Eaton & Bean, 1995; Elkins, Braxton, & James, 2000; Fries-Britt, 1994; Davis & Murrell, 1993; Gonzalez, 1997; Kraemer, 1997; Maras, 2000; Nora, 1993; Pascarella & Terenzini, 1980; Tinto, 1975; 1993;) indicate that in order to be successful in college, students must achieve both academic integration, which has been defined as “the development of a strong affiliation with the college academic environment both in the classroom and outside of class” (Nora, 1993, p. 235), and social integration, defined as “the development of a strong affiliation with the college social environment both in the classroom and outside of class” (Nora, 1993, p. 237).

What factors cause some students of apparently equal abilities, and similar demographic characteristics to successfully achieve academic and social integration while most others fail? Over the past twenty-five years, several somewhat

complementary models of student retention/attrition have been advanced to help explain the very complex process of college student persistence and retention.

Tinto Model of Student Integration

Vincent Tinto's Model of Student Integration enjoys "near-paradigmatic status, as indicated by more than 400 citations and 170 dissertations pertaining to this theory" (Braxton, Milem & Sullivan, 2000, p. 569). Building on Durkheim's concept of *anomie* (Durkheim, 1951), and Van Gennep's (1960) study of rites of passage, Tinto described the process of college student socialization as a series of interactions between the student and the college environment (Tinto, 1975, 1987, 1993, 1996, 1997, 1998, 2000). "One has to refer as did Durkheim in the study of suicide...to the social and intellectual character of an institution and the student and faculty communities that comprise it and the mechanisms which enable individuals to become integrated as competent members of those communities. As in the case of societies, one would expect institutions with low rates of departure to be those which are able to more fully integrate their students into their social and intellectual life" (Tinto, 1987, p. 104). According to the Tinto model of college student retention, the ability to achieve both academic and social integration, is not solely the result of cognitive abilities, but involves both cognitive and affective abilities, and results from the interaction of three groups of factors: (a) pre-college and individual characteristics (Bean, 1980; 1983; Moller-Wong, Shelley & Ebbers, 1999; Tinto, 1975; 1993; 1997) (b) conditions specific to a particular college or university environment, (Tinto, 1975; 1993; Davis & Murrell, 1993) and (c) personal characteristics of motivation and desire (Eaton & Bean, 1995; Newman & Newman, 1999).

Recognizing that students are transformed through a series of college-related experiences and interactions, Tinto described the college process as a rite of passage. Student retention is achieved when an individual successfully negotiates a process that begins with the student's psychological separation from his or her family or community of origin, goes through a transitioning phase while the student attempts to make new connections to sub-cultures or communities within the university environment, and, in the final stage of incorporation, successfully constructs a personal identity or self-concept that includes congruence with academic and social success as a member of the university community (Flores-Gonzalez, N., 1999; Tinto, 1975; 1993). When a student fails to successfully negotiate any one of the three stages, he or she develops a weak attachment to the university, and is at risk of separation (Elkins, Braxton & James, 2000).

The Tinto Model of Student Integration has been tested in a variety of settings including community colleges, four-year colleges and universities and both nursing and law schools (Astin, 1993; Liu & Liu, 1999; Mallette & Carbrera, 1991; Newman, & Newman, 1999; Pascarella & Terenzini, 1980; Seymour, & Hewitt, 1997; Tinto, 1993; and Wisely, & Jorgensen, 2000).

Particularly relevant to this study is the finding, by Tinto and others, that student identification with his or her university is a more important correlate for the retention of African American students than majority students (Tinto, 1975; Astin, 1975, 1977; Tracey & Sedlacek, 1984; Sedlacek, 1999). This identification of "belonging" to one's institution of higher education, in particular for minority students, appears to be a critical factor in the development of a student's self-concept as a collegian and to the integration within that self-concept of academic and social success (Flores-Gonzalez, 1999).

Bean Model of Student Attrition

In 1980, John Bean advanced the Model of Student Attrition, a theory of student retention that posited the importance of a student's beliefs in formulating decisions. Specifically, Bean's model presumes that behavioral intentions are the result of a process, in which beliefs shape attitudes and attitudes in turn, shape behavioral intents. A student's experiences with the academic and social components of an institution are presumed to shape their beliefs (Bean, 1980). Interestingly, Bean and Vesper found that of 50 environmental factors presumed to impact student beliefs, only six accounted for most of the variance in the dropout criteria, and that..."non-intellective factors played a major role in dropout decisions (Bean & Vesper, 1985 as cited in Carbrera, A.F., Castaneda, M.A., Nora, A. & Hengstler, 1992, p. 145)

In 1991, Carbrera, Castaneda, Nora & Hengstler conducted a longitudinal study intended to reconcile the Tinto Model of Student Integration with the complementary Model of Student Attrition advanced by Bean (1980). Carbrera and colleagues found that while the Tinto student integration model was more robust than the Bean model, there was significant support for the Bean model and Bean's "proposition that the role that factors external to the institution play on the college persistence process is by far more complex and comprehensive" (Carbrera, et al., 1992, p. 159) than that described by Tinto's Model of Student Integration. As a result, Carbrera suggested incorporating "external factors in the form of parental encouragement and support from friends and finances" (Carbrera, et al., 1992, p. 159) to the Tinto Model of Student Integration as a way of increasing the prediction of college retention.

Padilla Black Box Theory

In 1999, Raymond Padilla expanded on the Tinto model, advancing a theoretical framework to describe the pattern of successful student interaction within a single campus environment. According to the Black Box Theory, every university environment is composed of barriers or obstacles that must be overcome, and a student's ability to succeed "depends on the *salience* of each individual barrier for a given student and that student's ability to overcome a particular *configuration of barriers* on a given campus" (Padilla, 1999, p. 135). Successful students, according to Padilla, demonstrate 'expert knowledge' about campus obstacles that enables them to successfully negotiate the barriers that they encounter. This expert knowledge "can be conceptualized as possessing compiled knowledge that consists of two distinct knowledge components: Theoretical knowledge and heuristic knowledge" (Padilla, 1999, p. 136).

The Tinto Model of Student Integration, expanded by Bean and Padilla, can be used to predict which students will statistically be more likely to be retained in college, and which students are statistically more likely to leave, based on the presence or absence of certain personal, environmental or demographic factors. What is not currently known is (1) how these factors interact, or in what measure they influence a particular student's decision to remain in college; (2) whether academic integration drives the student retention process, or whether social integration impacts academic integration as Eaton and Bean suggest (Eaton & Bean, 1995); and (3) how students who do not possess the pre-college characteristics associated with successful college retention, succeed? This study will utilize student perceptions to answer these questions.

University Related Social & Environmental Factors

The second part of the student retention equation is the university environment. In order to be successful in college, a student needs to identify and connect both with an academic domain—his or her field of study, and the particular institution in which he or she is pursuing this study. While pre-college characteristics generally impact a student's ability to gain admission to and secure financial aid at a particular college or university, success within the chosen college environment is dependent on the student's ability to manage his or her interactions with the university environment in such a way that personal, and social needs are satisfied, and they achieve a sense of belonging. For this to occur, students must primarily believe that the campus is both welcoming and safe (Gloria & Kurpius, 1996). “There is a great body of unspoken and unexamined assumptions, values and mythologies that define an institution...only when an institution is aware of the current environmental climate is it able to demonstrate that multicultural diversity is a welcomed thread in the fabric of the institution” (Maras, 2000, p. 22-23). This cultural divide can be a particular challenge for minority students attending predominantly White institutions.

It has been asserted that “most institutions of higher education have not considered that the members of many racial and ethnic groups have complex identities based on class, generational status, gender, sexual orientation, ethnic identification, abilities, spirituality etc.” (Chronicle of Higher Education, 2003, p. B-7). Minority students attending predominantly White campuses frequently experience social and cultural isolation, and given the documented lack of faculty role models, have a more difficult time than their majority counterparts in finding individuals receptive to their

need to connect (Gloria et al., 1999; Hernandez, 1999). And connection is critical to student success, and to the development of a student's academic and social self-concept. Pascarella and Terenzini state "what happens to students after they arrive on campus has a greater influence on academic and social self-concept than does the kind of institution students attend (Pascarella & Terenzini, 1991, p. 184). Thus, it seems to matter little whether students attend universities that are public or private, urban or rural, large or small, research or teaching focused, or, in the case of African American or Hispanic students, a Historically Black College or University (HBCU) or a predominantly White college or university. What *does* matter is that every student must find within the chosen university setting an environment that he or she finds welcoming and supportive, and academically rewarding (Nora, Kraemer & Itzen, 1997).

In order to discover the impact of these very different academic environments on student retention, Pascarella and Terenzini recommend focusing inquiry on an "institution's sub-environment as holding more promise of detecting institutional effects" (Pascarella & Terenzini, 1991, as referenced in Cokley, 2000, p. 2). This would appear to attribute at least a portion of an institution's success in retaining students on retention programs that create student learning communities or microenvironments, programs such as the Vanguard Program that is the subject of inquiry here.

In 2001-2001, Ford-Edwards (2002) examined the perceptions of successful Black students at the university that is the site of this study, in an effort to develop a theoretical model of minority student success. Although only African American students were included in the Ford-Edwards study, Vanguard scholars were included among those interviewed.

In order to achieve academic integration within the university environment students must sometimes emotionally separate themselves from external influences—family influences and peers, that pull them away from academic obligations, and incorporate into their active support network, only those aspects from their home community that are congruent with their academic and career goals. This separation is particularly critical for commuter students, as well as students with racial and cultural backgrounds different from the predominant university culture. When students are unable to connect with other individuals with similar social and cultural backgrounds on campus, and instead remain emotionally supported by a social network external to the university, they may avoid social contact on campus, and fail to integrate with the university culture, thus placing them at high risk of attrition (Eaton & Bean, 1995). At the same time, there is considerable evidence to suggest that an effective strategy to achieve social integration on campus is to establish and strengthen social and ethnic ties of entering students through identification with other individuals on campus with similar values and cultures, and in effect, to create a micro-environment on campus that mediates the influence of the prevailing campus culture. Marable (1999, p. 47) documented the effectiveness of peer mentors in creating a supportive microenvironment for minority students in engineering: the “role of the peer group is extremely important in the socialization of newcomers to a foreign environment such as can be posed by an academic institutional setting”. When successful, this socialization results in the formation of close exclusive ‘cliques’ that help entering students ease the discomfort of coping with a new and strange environment. This finding was supported for African-American students by Friess-Britt in her study of the Meyerhoff program: “On majority

White campuses, these ‘like type’ communities have the potential to create a support system that provides some of the essential ingredients that historically Black campuses have provided for decades” (Friess-Britt, 1998, p. 563). The creation of these supportive micro-environments can be accomplished through a variety of methods: the use of peer-mentors in pre-college programs, the matching of students with faculty/staff advisors of color, and the effective linking of students with race and ethnicity based student organizations (Friess-Britt, 1997; 1998). However, it can be argued that the most effective way of creating a supportive microenvironment is through the intentional creation of a network of integrated programs such as the Meyerhoff and Vanguard programs. It is important to note that critical to a successful university environment or microenvironment is the “importance of high expectations for student achievement coupled with a mix of in-class and extracurricular challenge and support” (Davis & Murrell, p. 270). In particular, for minority students to feel welcomed and supported, there must exist within the university environment, both an expectation of excellence, and a philosophy of support built, not on remediation, but on strengthening existing capabilities.

A university environment is composed of the sum total of its faculty, administration, staff, and students, as well as their interactions with each other. Each university presents itself differently, with different patterns of financial aid, personal and academic support, housing and campus activities, expectations of behavior, values, and rituals. Every campus has a different “feel” to it—a campus specific culture, that is the totality of “the perspectives students develop in dealing with situations that arise in the school environment”(Becker, 1997 p.143), and many researchers have linked student

retention to the perception of a positive campus environment (Bean, 1980; Gloria, 1997; Newman & Newman, 1999).

When entering students find a campus welcoming, when they find academic and social support for their personal, social and career goals, when they believe that they can both learn and contribute within this learning community, they commit to the institution and to their course of study, and choose to stay. This is the core concept of all theories of student retention: that every interaction between a student and the university environment impacts his or her ability to achieve a feeling of belonging or integration within an institution, and their decision either to remain or to leave. “Other things being equal, the higher the degree of integration of the individual into the college systems, the greater will be his commitment to the specific institution and to the goal of college completion” (Tinto, 1975, p. 96).

Although every interaction between the student and the environment is potentially significant, some interactions have been shown to be more significant than others (e.g. climate of diversity, connection to faculty, undergraduate research opportunities, the impact of financial aid, participation in student technical organizations and campus housing).

Climate of Diversity

A student's perceptions of his or her *fit* with a particular institution begin with their first impression. Campus orientation programs that attempt to acclimate new students to the university's physical environment; academic challenges and social network play an important role in setting the tone (Perez, 1998). For all students, but especially for students of color, the presence of minority faculty and seeing other

minority students in leadership roles sets a positive message of inclusion and diversity (Blockus, 2000; Fries-Britt, 1994; Gloria, 1997; Nora & Carbrera, 1996; Gonzalez, 1997; NSF, 2000). More importantly, a campus message that communicates that students' cultural capital, their talents, customs, social traditions, music and ideas is welcomed, send a powerful message of inclusion that creates in students the desire for additional interactions, which in turn build a sense of community and institutional commitment (McNairy, 1996).

Connection to Faculty

Connection to faculty and a *nurturing pedagogical relationship* are consistently cited as being among the most powerful social environmental influences on student retention (Fries-Britt, 1994; Gonzalez, 1997; House, 2000; Maras, 2000; Pascarella & Terenzini, 1980, Seymour & Hewitt, 1997, Tinto, 1975, 1993, 1997, Ford-Edwards, 2002). The presence of faculty as student advisors, the *immediacy* of teaching personnel and advisory staff (Talbert-Johnson & Beran, 1999), the ability of undergraduate students to do research under faculty supervision (Nagda, Gregerman, Jonides, von Hippel & Lerner, 1998), student belief that faculty care about them and are invested in their personal and academic success (Blockus, 2000) have all been demonstrated as having a positive impact on academic success and student retention.

In a study of the persistence of non-traditional Hispanic students, Nora, Kraemer and Itzen (1997) found that students who were most connected to the university were students who had positive relationships with Hispanic faculty, staff and students. Similarly, Seymour and Hewitt (1997), found that minority students who had attended high school where they were in the majority, were at particular risk of switching majors

or of leaving college altogether without a supportive relationship with faculty or peers.

Seymour and Hewitt found that, for minority engineering students:

Students of color described faculty of color as performing additional functions that were relevant to their persistence: they act as role models in bonding them to the major; act as reminders that people of all races and ethnicities can succeed; preserve cultural connections and understand cultural constraints; and by demanding high standards from students, demonstrate the fallacies of stereotypes (Seymour & Hewitt, 1997, p. 384).

A key to why faculty-student interaction is important to student retention may be found in the finding that a student's relationship with a teacher or advisor can impact a student's perception of their academic abilities, academic achievement and motivation: "It was just those relationships with my teachers...they make me feel comfortable...and they are like 'you are a good student'. They motivate me even more" (Ford-Edwards, 2002, p. 114). The effectiveness of faculty-teacher interaction appears to be related to the concept of *teacher immediacy*: reflecting "a positive attitude on the part of the sender toward the receiver...Immediacy behaviors indicate approachability, signal availability for communication, increase sensory stimulation and communicate interpersonal warmth" (Talbert-Johnson & Beran, 1999, p. 434).

One obvious result of teacher immediacy would appear to be an improvement in the climate of the institution, and on the perception by students, that the university was a

more welcoming place. For minority students, this would appear to be particularly critical, as minority students often believe that White faculty (the predominant makeup within STEM disciplines) are prejudiced against them.

This prejudice “can take such forms as lower expectations of Black (and other minority) students than are warranted, overly positive reactions to work quality, reducing the quality of communications, and reducing the probability that faculty know students well enough to write reference letters” (Sedlacek, 1999). On the contrary, if a student’s self concept as academically capable is defined or reinforced as a result of positive interpersonal contact with faculty, and *immediacy* behavior, it is likely that he or she will be more motivated to persist in difficult academic content, or to seek out university resources to assist him or her to achieve academic and career goals (Blockus, 2000; Frymier & Houser, 2000; Woodside, Wong & Wiest, 1999). In a discussion of the impact of teacher immediacy on African American students, Talbert-Johnson and Beran make the point that “African Americans tend to use language to establish and maintain a sense of community and require a deeper, more intimate topical involvement with others. Many of the behaviors used to establish this sense of community are the same kind of behaviors defined by contemporary researchers as immediate” (Talbert-Johnson & Beran, 1999, p. 436). Gonzalez (1997) supports this interpretation for Latino students with his finding that students who entered college without the pre-college characteristics associated with academic success, but with an academic identity acquired through interaction with faculty and staff, saw themselves, not as hopelessly deficient, but rather in a developmental situation, within an environment that would enable them acquire the

characteristics necessary for college success as they interacted with the university environment.

In a controlled group study of the impact of an undergraduate research program on student retention, Nagda et al. (1998), found a 50% higher retention rate among African American students who had participated in undergraduate research. In interpreting the findings, Nagda suggested that for African American students in majority universities, faculty mentors might act as *institutional brokers*, connecting the student both academically and socially to the larger community. This faculty-student connection is significant to the student's creation of a self-concept that includes academic success within the university environment (Nagda et. al., 1998).

Cohort Learning Communities

Because of the relatively small number of African American and Hispanic students on campus and in STEM majors, minority students are “frequently forced to learn in isolation” (Seymour & Hewitt, 1997, p. 320). Membership in a cohort may be able to help alleviate these feelings of physical and social isolation and lack of connection to the university. As a part of the larger university community, cohorts can contribute to the overall atmosphere of campus diversity (Bullough, Clark & Wentworth, 2001). Further, the ability of students to identify with cohort learning communities, such as honors programs, fraternities or sororities, or other groups with clearly identified membership, has shown to be important factor in minority student persistence (Potthoff, Batenhorst & Fredrickson, 2001) because “the group effectively insulates its members from a reality which is harsher than they realize” (Seymour & Hewitt, 1997, p. 374).

In addition to creating a microenvironment that shelters the student, there is some evidence that cohorts can serve to stimulate and support academic achievement. In his work in the early 1980's, Uri Triesman, working with high potential minority students at the University of California, Berkeley found" that key elements in student success were: group study and support; student's awareness of their teacher's high expectations; the shared experience of success in solving problems of a progressively challenging nature; and the building of self-confidence" (Seymour & Hewitt, 1997, p.12-13). Similarly, Mallinckrodt (1988, p. 60) found that "minority student retention, in particular may be increased through interventions designed to develop more high quality personal interactions". Clearly the cohort serves to create opportunities for "high quality personal interactions, mediates the effects of the external world, and create a 'safe harbor' for cohort members; however research on the effects of cohort participation on academic achievement have been mixed. Although Tinto (1998), found that "learning communities...provide both academic and social supportin which students continued at a rate approximately 25 percentage points higher than those students in the traditional curriculum" (Tinto, 1998, p. 168), Dyson and Hanley (2002) found that participation in cohorts can impede academic success. It is hoped that the present study will contribute to an understanding of the conditions under which cohorts can support academic success

Impact of Financial Aid

Perhaps because of the link between family socioeconomic status and persistence, the importance of financial aid to low-income students, including many African American and Hispanic students, cannot be underestimated. For very low-income

students, there is ample evidence to indicate particularly for minority students, that the availability of sufficient financial aid is the determining factor in whether or not such students enter college (Carbrera, et. al., 1992; Georges, 1999; Stampen & Carbrera, 1986).

Once in college, financial aid makes an equally important impact on a student's ability to successfully interact academically and socially with the college environment (Chenoweth, 1999; Fenske, Porter & DuBrock, 2000). With sufficient financial aid, a student is able to 'level the playing field' with more affluent students. It has been found that financial aid effectively compensates for the disadvantage of low income by making low-income students as likely to persist in college as higher income students who do not receive aid (Stampen & Carbrera, 1986). A generous financial package made up of grants, and not loans, enables a student to reside on campus, engage with the campus community, spend more time engaged in study, and be able to participate in campus based activities, all geared to increasing his or her attachment to the university (Tinto, 1987, Georges, 1999).

Without sufficient financial aid or the right kind of financial aid—loans vs. grants, students must work to earn the necessary funds to remain in college. Not only does this add to the already significant pressure on a student, but also the 20 to 30 hours typically spent earning money to remain in college, removes time that a student would otherwise spend engaged on campus. "Particularly in rigorous science-based disciplines such as engineering, where the time demands of course work make employment while in school impractical, inadequate funding seriously handicaps the retention prospects of those who enroll" (Georges, 1999, p.15). This is such a problem that, according to one

respondent from a nationally recognized Historically Black University (HBCU), “Most students leave because of financial aid issues” (Chenoweth, 1999, p.40). According to Stampen and Carbrera (1986), financial aid “narrows the resource gap between economically disadvantaged students and more affluent students” (Stampen & Carbrera, 1986, p. 28).

Student Employment

Closely related to the question of financial aid is the issue of student employment, including work-study, which many students perform as a part of their financial aid package. While work off-campus has a negative impact on student persistence (Anderson, 1981), this has not been found true of on-campus work, particularly of work-study. Because of the dual work/study aspect of campus work, and the fact that it is performed on campus in which there is close and continued interaction with faculty and staff, there is some evidence that continued performance of work-study enhances student persistence (Tinto, 1987; Anderson, 1981; Nora, 1987). Tinto explained the importance of work-study as follows: “On one hand it provides much needed financial aid. On the other, it leads students to make contact with other people on campus in particular faculty and staff. As a result, work-study alters both the cost and benefit side of the equation” (Tinto, 1987, p. 68).

Co-operative Education and Internships

Similar to the findings for work-study positions, career internships and co-operative education serve to link students to their career goals, and provide them both with funds to help defray the cost of education, as well as valuable career experience. Internships may provide students with funds to help close the financial aid gap, and when

done well, provide role models and mentors to guide a student into a desired career path. Research findings regarding the impact of internships on student retention, indicate a positive relationship between internships and both academic and social integration, thus contributing to increased retention (Nora, 1987; Tinto, 1993).

Participation in Ethnicity-Based Technical Organizations

Participation in ethnicity-based technical organizations such as: National Society of Black Engineers (NSBE), or Society of Hispanic Professional Engineers (SHPE), can contribute to the increased retention of minority students in STEM disciplines (Mallinckrodt, 1988; Torres, 1999). Particularly on university campuses where there are few minority faculty role models, “organizations where these students can cluster and share college experiences become enablers for them (and) also provide opportunities for students to be socially integrated into the academic and campus environment” (Talbert, B., Larke, A. & Jones, W.A., 1999, p. 2).

Within the environment of a minority-specific, technical organization students meet other individuals of color with similar interests, and through participation in local chapters and regional and national conferences are exposed to potential role models and mentors, and see individuals similar to them who are succeeding in difficult technical disciplines. Most importantly, through participation in minority technical organizations, “the critical mass of other individuals at an academic or industrial level with whom the student shares a common background or culture, changes the student’s perspective regarding information or issues” (St. Omer, Sampson & Lee, p. 5). Thus, for students at the target university, participation in such events as NACME forums and leadership conferences and SHPE and NSBE conferences can assist students to experience

networking and mentoring and to create for themselves the supportive microenvironment within the broader campus community that may contribute to increased retention.

University Housing

Living on campus has consistently been shown to improve academic achievement and student retention (Anderson, 1981; Astin, 1977; Broissoit, 1999; Johnson & Romanoff, 1999; Pike, G.R., 1997, 1999). “Students who live in residence halls with strong academic orientations have greater achievement than do other students” (Pike, Schroeder & Berry, 2000, p. 611). Students who reside on campus appear to be protected from outside influences, and thus may be better able to negotiate their separation from community of origin and the creation of a self-identity that includes academic achievement. Living within the university community also exposes them to other students, thus increasing the campus-based interactions needed to successfully transition to the incorporation stage where they achieve a sense of belonging: “Living off campus does result in ...a lower sense of integration into the college as well as to lower educational and occupational goals” (Anderson, 1981, p. 13).

Beyond the mere fact of residing in university housing however, there is further evidence that residence within small learning communities, within the larger campus community, increases the level of social and academic integration, peer and faculty interaction, and indirectly, academic success and ultimately student retention (Pike, G., Schroeder, C. & Berry, T, 2000; Pike, G. 1999; Wisely, N. & Jorgensen, M., 2000). “Residential learning communities indirectly enhance persistence by significantly increasing faculty-student interaction and enhancing the importance of faculty-student interaction to persistence.” (Pike, Schroeder & Berry, 2000, p. 618). Wisely & Jorgensen

(2000) provide an explanation for the development of strong academic sub-cultures within specialized residence halls: “behavior (here disciplined study behavior), is learned through active association with others who have already mastered (or wish to master) the behavior and who share the value of academic success. Group values and ideas (here, academic success) are then automatically enforced...because all groups positively reinforce members who conform to their standards, and negatively sanction those who do not” (p. 3-4).

Impact of University Environment on Student Retention

Implicit in the Tinto, Bean and Padilla theories of college student retention is that the college environment itself constitutes a distinct culture with a specific organizational structure, values and beliefs, and rules and norms to which every college student must be socialized in order to be successful. For example, research has shown that “Being in a four year college (as distinct from a 2-year institution), increases peer discouragement of vocational schooling and/or work, and has a positive effect on educational expectations (Anderson, 1981, p. 12). When socialized, students feel “attached” or connected. Those students who perceive that they mesh with the college environment, and who believe that their personal, career and academic goals are in alignment with those of the institution are more likely to persist. Although differences in the persistence of “minority” vs. “majority” students is noted and discussed in many of the studies reviewed, few studies have focused specifically on the issue of college persistence of African American, Hispanic and American Indian students—the population which represents the majority of NACME Vanguard Scholars.

Non-Cognitive Abilities

In an examination of college student retention, the third set of factors to be considered resides within the student's own personality and psychological makeup. While it has been shown that having positive pre-college factors improves a student's chance of college enrollment and graduation, many successful undergraduate students, and the majority of minority undergraduate students lack the pre-college characteristics deemed necessary for college success. They come from economically disadvantaged homes, often with a single parent wage earner, have parents who have had little formal education, have graduated from urban public schools with little access to advanced placement or honors courses, are the first in their families to attend college and to aspire to professional careers, have not taken either the number or caliber of mathematics, science and writing classes needed to succeed in college, have not participated in pre-college programs and have been counseled by school counselors, friends and community residents not to "aim too high". For this reason, practitioners have looked to the student's own personality and psychological attributes to explain both the persistence of students and the reasons for their leaving.

Many researchers (Allen, 1999; Astin, 1975, 1977, 1993; Bean, 1980, 1982, 1983; Bean & Vesper, 1990; Carbrera, Nora & Castaneda, 1993; Gonzalez, 1997; Rossman & Kirk, 1970; Sedlacek, 1996; Waterman & Waterman, 1972; Wolfe & Johnson, 1995) have developed profiles of minority students who are likely to succeed in the intense emotional atmosphere of a predominantly white college campus. These personal attributes include: realistic self-knowledge, self-control and the ability to take risks, intrinsic motivation, a positive self-concept that includes academic achievement,

dedication or goal commitment, persistence, conscientiousness or the ability to overcome obstacles, resilience and a refusal to accept failure, the ability to understand and deal with racism, the ability to set long term goals, demonstrated community service, and successful leadership experiences (Friess-Britt, 1994; Sedlacek, 1999). Gonzalez (1997) also believes that, for Latino students (and by extension, other minority students), a healthy sense of humor is needed.

The Relationship of Non-Cognitive Abilities to Retention

Non-cognitive abilities play a role in all three models of student retention. Although Tinto discounts the role of personality in college persistence, stating that “there is little evidence to support the notion, beyond the issues of commitment or motivation, early leavers have a unique personality profile” (Tinto, 1993, p. 44), he also states that “there may...be specific traits of personality which, on the average, tend to describe real differences between the patterns of response of persisters and leavers generally” (Tinto, 1993, p. 45). In more recent work, Tinto has causes of student departure map to a student’s experiential or contextual intelligence: 1) adjustment difficulties, 2) uncertain or narrow goals, 3) weak or external commitment, 4) financial difficulties, 5) incongruence, or the lack of ‘fit’ between the student and his or her university, and 6) isolation (Tinto, 1996, 1997).

In the Bean model, non-cognitive abilities play a more active role. In his Model of Student Attrition, Bean discussed the importance of the “reflective regulation of emotions to promote emotional and intellectual growth”(Bean, J.P., 1980). While ‘institutional commitment’ was found to be the most important determinant of student retention , “non-intellective factors played a major role in dropout decisions” (Bean & Vesper, 1985 as

cited in Carbrera, A.F., Castaneda, M.A., Nora, A., & Hengstler, 1992, p. 145.). Lastly, in Padilla's 'Black Box Theory' students must demonstrate 'expert knowledge' that is composed of both theoretical and heuristic components (Padilla, 1999).

Emotional Intelligence and Non-Cognitive Abilities

More recently, Salovey & Mayer, (1989), Goleman, (1995), Sternberg (1985), Bar-On and Parker, (2000), and others have posited the existence and importance of a set of mental abilities, conceptualized as emotional intelligence, which give one "the ability to monitor one's own and others' feelings and emotions, to discriminate among them and to use this information to *guide one's thinking and actions* (italics added) "(Salovey and Mayer, 1989/1990, p. 189.) Sternberg suggests that there are three types of intelligence: componential, experiential and contextual (Sternberg, Grigorenko & Bundy, 2001). The first type of intelligence, *Computational intelligence* is the only one of the three types of intelligence that is cognitively based and is the type of intelligence measured in standardized tests.

The second type of intelligence is *Experiential Intelligence*, which consists of "the ability to interpret information in changing contexts; to be creative" (Sedlacek, 2002, p. 1). This type of intelligence allows individuals to develop innovative solutions to problems, and it particularly useful in helping individuals adjust to new situations.

Contextual Intelligence, the third type of intelligence "has to do with the ability to adapt to a changing environment; the ability to handle and negotiate the system" (Sedlacek, 2002, p. 1). This type of intelligence allows individuals to correctly interpret the contextual "rules" essential for success.

The Non-Cognitive Questionnaire (NCQ)

For more than twenty years, William Sedlacek and his colleagues have conducted research on the application of Experiential and Contextual Intelligence on college retention, particularly for under-represented minority populations. Their continuing research suggests that standardized tests do not measure either experiential or contextual intelligence because they are non-cognitive in nature (Sedlacek, 1991, 1996, 1999, 2000, 2004 Tracey & Sedlacek, 1986). Other findings indicate that students who differ from the majority culture that on most campuses are White and male, and use experiential and contextual intelligence to make decisions (Sedlacek, 2002).

Addressing the specific challenges to African American students in predominately white institutions, Sedlacek (1996, p. 3) notes, “African Americans tend to rely more on experiential and contextual intelligence to solve problems. Hence, they are just as ‘smart’ as any other racial group, but may present that intelligence differently”, in a way that is neither recognized nor assessed by standardized tests.

In order to fully assess students’ experiential and contextual abilities, Sedlacek developed the Noncognitive Questionnaire (NCQ), which has demonstrated validity in predicting academic success with a wide variety of racial and ethnic populations. In a study which examined the relative predictive value of the NCQ, SAT scores, and high school GPA’s in predicting the retention of first year, low-income, first generation college students, the NCQ was found to be the strongest predictor of student retention from first to second years” (Ting, 1998, p. 19). Pickering, Calliotte, and McAuliffe (1992) found the use of the NCQ highly successful in the prediction of academic success

and more accurate in predicting college academic success than high school grade point average, high school class rank or SAT scores.

In the NCQ Sedlacek (1991, 1996, 1999, 2002, 2004) has isolated a series of eight psychosocial variables that have been shown to be useful predictors of the academic success and persistence of African American and other minority students and links these to experiential and contextual intelligence. These eight non-cognitive variables are described below:

Positive Self- Concept/Confidence

This variable is defined as: “Strong self-feeling, strength of character, determination, independence” (Sedlacek, 1996, p. 90). The concept relates to a student’s ability to identify him or herself with the academic and social culture of the college campus, and confidence that he or she will persevere through graduation. “Confidence in one’s ability to persevere through ‘the system’ seems based on creatively applying solutions to new challenges, which is an aspect of experiential intelligence” (Sedlacek, 1996, p. 80).

In order to achieve this confidence and ‘positive self-concept’ students must incorporate the pursuit of academic goals and academic success within their definition of who they are and what they value. This ‘academic self-concept’ has been identified as the strongest predictor of academic success for both minority students (Schwartz & Washington, 2002) and majority students (House (1992, 1993, 1995, 1999, 2000).

In examining the impact of non-cognitive variables on the retention of minority students, several researchers, (Astin (1975, 1993; Tracey & Sedlacek, 1984; Sedlacek, 1999) have found that “identification with an institution is a more important correlate of

retention for Blacks than for other students” (Sedlacek, 1999, p.539). So important is the development of self-confidence to African American student retention that Westbrook and Sedlacek state that “any minority student who admits to any possibility of not graduating is less likely to graduate than one who refuses to accept that anything can prevent him or her from graduating” (Westbrook & Sedlacek, 1988, p. 86).

Similarly in his study of Latino students, Gonzalez found that students who were ultimately successful were those who “were able to build their self-confidence through a series of positive events while at the university. All felt that self-confidence was definitely needed in order to persist...” (Gonzalez, 1997, p. 123).

For African American and Hispanic students, identification with a supportive micro-culture such as a Meyerhoff, Vanguard or other similar program within a university environment may help to anchor the student to a campus that he or she would not otherwise easily identify with and facilitate the development of an positive, academically-based self –concept.

Realistic Self-Appraisal, Especially Academic

This non-cognitive variable is described as: “recognizes and accepts any deficiencies and works hard at self-development. Recognizes need to broaden his or her individuality” (Sedlacek, 1996, p. 90). For every student, academic success involves the ability to ‘take readings’ of their relative standing within a class and to take corrective action before a final assessment of their mastery of the subject is made. Because minority students on a predominantly White campus are often viewed differently by faculty and majority peers, it is often difficult for students of color to gain a realistic appraisal of their academic and social success in sufficient time for them to implement

needed changes. To be successful in this area, a student must initiate contact with faculty, and begin a process of relationship building.

Minority students who are unable to penetrate the informal communication system that goes on among students, faculty, and staff are more likely to have difficulty determining what is important and what is not. Minority students who do not know how evaluation is done in the school, students who are not on the ‘past exam circuit’, students who do not know how they are doing until grades come out, and students who do not know how they compare to the other students in their classes are at a disadvantage (Westbrook & Sedlacek, 1988 p. 86).

For this reason, realistic self-appraisal is a good indicator of a student’s ability to be successful in college.

Focusing on the academic success of Latino students, Gonzalez (1997) states that college advisers can often help students to make a more realistic appraisal of their academic progress, and can make the difference between success and failure. With a good advisor, students can better marshal university resources to help them succeed, to “build on the positive experiences and use the negative ones as learning experiences” (Gonzalez, 1997, p. 111). Put in practical terms, when students are connected to other students, to faculty, and to the university in general, they are more likely to be on the “inside track” and able to realistically assess their academic performance.

Again, connection to a campus-based support group that includes faculty and staff may help minority students increase their ability to realistically assess their academic

deficiencies and develop realistic plans for addressing them. Such programs create a safe environment for students to begin to build trusting relationships with older students, faculty and staff, relationships that can form the core of a support network that allows for the transmission of heuristic knowledge that will help a student succeed within a particular academic environment.

Ability to Successfully Negotiate the System

Also called “*ability to understand and cope with racism*” the NCQ defines this concept as: “Realist based on personal experience of racism. Is committed to fighting to improve existing system. Not submissive to existing wrongs, nor hostile to society, nor a ‘copout’. Able to handle racist system. Asserts school or organization role to fight racism” (Sedlacek, 1996, p. 91).

This concept has two components: Ability to successfully negotiate a system, and ability to cope with racism.

Negotiating the system. For majority students, developing the ability to ‘work a system’ to one’s advantage is a valuable skill. According to Sedlacek, developing the heuristic knowledge to negotiate a complex university environment is positively associated with academic achievement and college retention (Tracey & Sedlacek, 1984, 1985; Sedlacek, 1999, 2004).

Ability to cope with racism. In addition to the coping skills required of majority students, minority students must in addition, master the ability to understand and cope with both overt and institutionalized racism. In negotiating an unfamiliar social terrain, they must learn to assess situations appropriately, and develop appropriate response mechanisms. “An optimal strategy is one in which Black students have differential

response patterns to racism. They take action when it is in their best interests and do not take action when it might cause them more trouble than it is worth to them” (Sedlacek, 1999, p. 540). In her study of African American students at the university that is the site of this research Ford-Edwards found that “participant decisions to stay are most influenced by their ability to adjust to their minority status...and that students adjust by getting involved” (Ford-Edwards, 2002, p. 116).

In one a recent study involving Hispanic and Asian students, Sedlacek “found that the better Gates Millennium Scholars (who were African American, American Indian, Asian American, and Latino) handled racism the higher were their college grades” (Sedlacek, 2004, p. 43).

Preference for Long-Range over Short-Range Goals

This ability is defined as being “able to respond to deferred gratification” (Sedlacek, 1996, p. 90). The extent to which students are able to defer gratification is positively related to college retention. “A key assumption in the higher education system is that students work currently for rewards received later”(Sedlacek, 1999, p. 543). Thompson and Fretz (1991) found that for both African American and majority college students, having a clearly defined goal of college degree attainment, was the single best predictor of academic and social success.

For minority students, history has demonstrated that hard work and clearly defined goals do not always translate into success. “Skinnerian principles suggest that people delay gratification with reluctance when what they can get today looks more attractive than what they can get by waiting until some later time, or when they have no reliable data to suggest that they will get in the future what they work for today”

(Westbrook & Sedlacek, 1988, p. 87). When the relationship between effort and reward is unclear, it may be difficult to set long-term goals and to persevere. The extent to which students are able to confidently link hard work and effort in the present to academic, career and financial goals in the future, the more likely they are to remain in college through graduation.

Gonzalez makes the interesting point that successful Latino students may develop a “clearer understanding of their goals as they progress academically” (Gonzalez, 1997, p. 112). That is, that for students for whom college attendance is not normative, the enormity of a long- range goal such as college graduation can best be handled by breaking it into smaller short-range goals such as gaining entrance to college and choosing a major. The long-term goal of college graduation thus becomes more attainable the longer the student persists. Gonzalez found, for instance, that Latino students increased in confidence and goal specificity after their high school graduation, again after their completion of a summer bridge program between high school and college, and after each term where they were able to see clear progress towards academic goals.

Availability of Support in Times of Crisis

Students face difficult adjustments in their path to college success. To the extent that students are able to identify specific sources of emotional support and forge trusting relationships with college faculty or staff, they are better able to negotiate the academic and social pitfalls that they will inevitably encounter. “Seeing the necessity of developing such a relationship with a support person, identifying the person and effectively utilizing that support probably require both experiential and contextual intelligence” (Sedlacek,

1996, p. 82). For entering students who have not yet developed strong campus relationships, the support of family and peers is critical. (Bank, Slavings, & Biddle, 1990; Sedlacek, 1999). Students with a strong and identifiable support network will be more likely to maintain their original achievement goals and persist.

Acquired Knowledge in a Field

Acquired knowledge in a field is defined in the NCQ as “unusual or culturally related ways of obtaining information and demonstrating knowledge” (Sedlacek, 1999, p. 539). The concept refers to the ability of an individual to acquire knowledge or information outside of the classroom—through experience or personal study. According to Sedlacek, because minority students may have been shut out of traditional learning environments by means of placement tests, or from traditional learning environments by poor advising, their ability to learn independently and demonstrate knowledge through projects, or credit by examination becomes a critical factor in determining academic success and college persistence. “Successful students of color are characterized by an ability to utilize information in varied contexts and to innovatively demonstrate knowledge acquired in a field. Experiential intelligence is exemplified by these students” (Sedlacek, 1996, p. 82).

Successful Leadership Experiences

African American and Hispanic American students who are successful in college have often demonstrated their ability to “organize and influence others, often within their cultural racial context” (Sedlacek, 1999, p. 543). Being able to see issues from different points of view (experiential) and influencing others via mediation, advice giving, or consultation (contextual) are both components of successful leadership (Sedlacek, 1996,

p. 82). Thus, having a wide variety of culturally based opportunities for students to participate in and acquire leadership experiences as a part of their undergraduate educational experience, can be extremely helpful in linking students to the university and providing them with fulfilling experiences where their achievements can be validated.

Often students' involvement in their cultural community is developed around and linked to 'giving back' to the community through community service. Through leadership in culturally based organizations where a student's particular language and cultural heritage is accepted, a student's identity as a collegian and as a future leader can be affirmed and reinforced. The student can then take this revised, positive self-concept and use it as a way of gaining entrée and acceptance in the broader university community. Although most research in this area has examined the importance of leadership in the retention of African American students, it appears to be an important factor in the retention of other minority students as well: "For Hispanics, leadership experiences may translate into increased retention in college, more participation in campus and community life before and after graduation, and increased personal growth and the development of many interpersonal skills" (Fuertes & Sedlacek, 1993, p. 278). Indeed, in all of Sedlacek's research, leadership experience and its partner variable, community service, are the strongest predictors of student retention for African American, Hispanic, and other 'non-traditional' student populations.

Involvement in the Cultural Community

Sedlacek's last non-cognitive variable is defined, as "Has involvement in his or her cultural community" (Sedlacek, 1996, p. 90). There are two aspects of this variable: strong identification with a cultural community, and community service.

Strong identification with a cultural community. As part of gaining a larger support network, successful Black and Hispanic students will align themselves with culturally based sub-communities on campus and within the wider community. “Blacks need a supportive group that can give them the advice, counsel, and orientation to sustain them as they confront the larger, often hostile systems they must negotiate” (Sedlacek, 1987, p. 542).

Community service. Often, this community involvement is developed around “giving back” through community service, serving as mentors and role models to younger children, and creating pathways to success for others. Through community service, a student’s identity as a collegian and as a future leader is affirmed and reinforced, thus community involvement is often linked to Leadership development. Importantly, Sedlacek states that in order to create a community for under-represented students to identify with, “there needs to be a ‘critical mass’ or sufficient number of (minority students) on a campus to develop a community” (Sedlacek, 1987 p. 542).

The eight non-cognitive variables outlined above represent the personal characteristics that college students bring to their college experience. What we will examine now is how these personal characteristics and pre-college experiences mesh with the university environment to attach or deter a student’s academic and social success.

Successful Retention Programs

Once students have been accepted to college, the job of student retention has just begun. Although one might think that the majority of students would leave a university prior to graduation because of an inability to meet academic standards, or because of weaknesses in their computational intelligence, this is not generally the situation, and

“departures for academic reasons represent only 30 to 35 percent of all leaving nationally” (Tinto, 1996, p. 1).

There is general agreement that colleges and universities are able to positively impact their persistence and retention in college through the provision of programs and services mapped to the strengthening of personal non-cognitive and institutional factors shown to increase retention (Fries-Britt, 1994; Gonzalez, 1997). “In the final analysis, the key to successful student retention lies with the institution, in its faculty and staff, not in any one formula or recipe. It resides in the ability of faculty and staff to apply what is known about student retention to the specific situation in which the institution finds itself” (Tinto, 1993, p. 4).

Recognizing that both individual characteristics and university environment combine to contribute to the successful retention of college students, universities have introduced a variety of programs that include retention strategies targeted to pre-college, university and personal factors identified with college success in order to improve the academic and social integration of students and increase the graduation rates of minority students (Perez, 1998). However, the majority of these programs address cognitive factors—focusing on the improvement of student grades, and few programs targeted to the retention of minority students attempt to shape admissions, orientation, teaching and advising practices in order to incorporate some of the personal characteristics identified by Bean, Sedlacek and others as critical to student persistence and academic success. As was observed by Seymour & Hewitt (1997), “minority programs based on presumption of needs common to all ‘minorities’ tend to founder, quite largely, because they do not address the needs of specific racial and ethnic groups” (p. 322).

In analyzing the reasons given by *students of color* for leaving STEM majors, Seymour and Hewitt identified three factors with implication to college retention programs: (a) inappropriate reasons for their choice of a STEM major (b) conceptual difficulty with one or more STEM subjects; and (c) inadequate high school preparation with basic subjects and study skills (Seymour & Hewitt, 1997, p. 324).

In their seminal study of the experience of minority students in highly selective colleges and universities, Bowen and Bok (1998) examined a variety of programs designed to increase minority student retention. Their findings recognized the transformative nature of the college experience on students, and support the importance of student socialization into the culture of the institution through multiple social and academic interactions:

Successful programs typically combine all or most of several features. They create an aura of high expectations, with the emphasis on meeting intellectual challenges rather than receiving remediation to achieve a minimum standard. They encourage participants to work in groups, where students can help one another and provide mutual support. They offer appropriate advising and counseling. They often assign students to successful minority professionals, who act as mentors. They provide summer internships to broaden student experience. They offer enough financial aid to remove the risk of students having to work excessively to support themselves or even drop out for lack of funds. Some programs involve parents and keep them continuously informed

so that they can lend psychological support and encouragement to their children (Bowen & Bok, 1998, p. 87).

Using the criteria outlined by Bowen and Bok, a few programs can be considered to be exemplary, supported by research findings. Among them are:

The Meyerhoff Scholars Program (UMBC)

The Meyerhoff Scholars Program at the University of Maryland, Baltimore Campus is widely considered to be among the most effective retention programs for minority students. Developed in 1989, the Meyerhoff program is a scholarship program established for *academically talented* African Americans interested in science, engineering, mathematics and technology majors. Funded with a grant from the Meyerhoff Foundation, scholars receive a comprehensive scholarship package, including funding for books and personal computers, and have access to holistic counseling and tutorial services (UMBC, 2000). Because they are drawn from a pool of previously identified academically talented students, Meyerhoff Scholars have been “valedictorians, salutatorians, National Achievement Finalists, honor society students, and Maryland Distinguished Scholars.... in the top five percent of their high school class” (Friess-Britt, 1994, p.6).

Unlike the majority of campus-based minority retention programs, the Meyerhoff Scholars Program was built on a foundation of academic excellence and the expectation of success, based on the belief that every student can succeed if provided the appropriate support and resources (Friess-Britt, 1994). This philosophy excellence and success is supported by research: “When retention programs consisting only of (remedial) academic support services...are the institution’s major or only response to retention, they support a

cultural deficit model, focus on only one aspect of retention, and placed the sole responsibility for retention at the feet of the students.... these strategies communicate to students of color that *something is wrong with you, and we will fix you to make you whole* (McNairy, 1996, p. 2).

The Meyerhoff Scholars Program is built on a foundation of thirteen essential and interrelated program components that reflect factors determined to have a positive effect on student retention and achievement: recruitment, summer bridge program, scholarship support, study groups, program values and an expectation of excellence, program community, personal advising and counseling, tutoring, summer research internships, faculty involvement, administrative involvement and public support, mentors and family involvement.

In 1994, Sharon Friess-Britt conducted a case study of the Meyerhoff Scholars, as a test of Tinto's theory of student attrition. At the time, there were five classes of Meyerhoffs, and the program had achieved unheard of results: "The first three cohorts of 69 Meyerhoffs had maintained a mean cumulative GPA of 3.4.... The persistence rate of the 69 Meyerhoffs is 98.1 percent in the sciences" (Friess-Britt, 1994, p.11). Friess-Britt found, that although the Meyerhoff program provided theoretical support in total for the Tinto model, that faculty-student interaction where there were shared values was most important to their academic and social integration and overall retention (Friess-Britt, 1994).

Special Program for Talent Development (University of Rhode Island)

The Special Programs for Talent Development (SPTD) was begun in 1968, in response to the assassination of Dr. Martin Luther King, Jr. The purpose of the program

is to promote the enrollment and retention of underrepresented minority students, particularly those considered economically and educationally disadvantaged.

Unlike the Meyerhoff program at UMBC that targets academically talented students, the criterion of acceptance into SPTD programs is *ineligibility through regular admissions* (italics added for emphasis) (Gonzalez, 1997, p. 14). Like the Meyerhoff program SPTD provides students with academic and social support services and full scholarship support. Also similar to the Meyerhoff program, is the requirement that SPTD students attend a pre-college summer program, receive mandatory academic and social counseling, participate in study groups, and live together during the pre-college summer program.

Although SPTD students do not possess many of the pre-college factors which have been shown to positively impact college retention, and in fact, begin college knowing that they do not qualify for *regular* college admissions, the retention of SPTD students is an impressive 73%, a figure higher than that for the University of Rhode Island as a whole, or for the population of non-SPTD minority students (Gonzalez, J., 1997, p. 13). What makes for the success of SPTD students? According to Jose Gonzalez, himself a product of SPTD, two factors not generally addressed in student retention literature are critical to SPTD success: “the ethnic bonding that Latinos form and their involvement in an educational opportunity and support program” (Gonzalez, 1997, p. 263).

NACME Vanguard Program

The NACME Vanguard Program shares many of the same program elements as the successful Meyerhoff and SPTD programs profiled above. Like the Meyerhoff

program, the goal of the Vanguard Program is to increase the number of minority graduates in science, mathematics, engineering and technology, recruits students in cohorts, is based on a philosophy of excellence and expected success, provides full tuition support and emphasizes holistic advising addressing both academic and personal needs, an emphasis on group study and peer support, appropriate tutoring and mentoring, and opportunities to work with faculty in research. Like the SPTD program, the Vanguard program a) targets economically and educationally disadvantaged students from large urban public schools, b) includes a more diverse ethnic composition—including African American, Hispanic, Asian and Caucasian students, and c) emphasizes the creation of a family atmosphere of staff and peer support.

Unlike the Meyerhoff program that selects academically talented students with excellent SAT scores (an average of 1285 for Fall, 1997 (UMBC, 2002), many of whom come from college-educated, middle class families the Vanguard program selects students who are believed to have high but unrealized potential in science, mathematics, engineering and technology, most of whom are first generation college attendees from families who are economically disadvantaged and who have little experience with a university environment. Unlike the SPTD program, the Vanguard program recruits student from a wide variety of locations and ethnic backgrounds, and all students are enrolled in science, mathematics, engineering and technology majors—majors considered among the most academically rigorous and the most vulnerable to student attrition.

Like the Meyerhoff and SPTD programs, the Vanguard Program has been shown to be effective in retaining African American, Hispanic and other populations at rates far higher than those for either the general population as a whole, the STEM population, or

for non-Vanguard students. But why? It is hoped that a study of Vanguard Scholars will provide additional insight into the factors contributing to the persistence of under-represented minority students in STEM disciplines on a predominantly white campus. The pre-college characteristics of Vanguard Scholars vary greatly from those previously identified as contributing to college success. If, as has been demonstrated by Tinto, Bean and Padilla, academic and social integration are the keys to successful college retention on predominantly white colleges and universities, how can we explain Vanguard Scholars' ability to compensate for their lack of pre-college factors associated with college success, in achieving academic and social integration? A study of academically successful, economically disadvantaged, first generation college students may provide answers helpful to college administrators in the design of future intervention programs.

CHAPTER THREE: METHOD

Research Methodology

The purpose of this study was to examine the non-cognitive, pre-college and social environmental factors that Vanguard Scholars believed had contributed to both their college retention and academic success. The population under study consisted of students who had been enrolled as Vanguard Scholars, a defined scholarship and support program at Drexel University, a selective, predominantly white, urban, cooperative education, five-year, private university in the Middle Atlantic Region, between 1996 and 2003. This chapter identifies the rationale of the study, outlines the process of the review of related literature, describes the population of the study, describes the research instruments, and chronicles the data collection procedures and methods of analysis that have been used to develop an understanding of the program's impact on college retention among Vanguard Scholars.

The following research questions guided the study:

1. What are the non-cognitive character traits shared by Vanguard scholars and how might these make them more likely to persist in college in engineering and technology related disciplines?
2. What do individuals, enrolled as Vanguard Scholars, perceive as the pre-college characteristics that contribute to the high graduation rates of students in the program? How much importance do students ascribe to such factors as gender and race, socio-economic status, family characteristics, parental support, and high school preparation? How do they see the interplay of these

factors in predicting college persistence, academic success and graduation rates?

3. What do Vanguard Scholars perceive as the university-related factors that contribute to the high retention and graduation rates of students in the program? How much importance do students ascribe to such factors as university climate, level of financial support, faculty and staff involvement, participation in campus-related activities, cohort learning experiences, shared residential living, research opportunities, and academic and social support?

W. I Thomas posited the theorem that “If men define situations as real, they are real in their consequences” (Thomas, 1923, p. 1). In expanding on this theorem he further stated “preliminary to any self-determined act of behavior there is always a stage of examination and deliberation which we may call the *definition of the situation*...gradually a whole life-policy and the personality of the individual himself follow from a series of such definitions” (Thomas, 1923, p. 1). Because reality lived is that which is constructed by individual participants, and because an individual’s perceptions drive their actions and decisions, this study will make no attempt to determine “objective reality”, but will, instead focus on students’ *perception* of those factors that contribute to their college retention and persistence.

Research Framework

A combined research methodology was used within this study employing a qualitative framework and both qualitative and quantitative methods. It was my belief that, in order to best understand the NACME Vanguard program with all of its complexities, and its impact on student retention, that a combined framework of inquiry

would facilitate development of a more complete understanding of the program than would either a quantitative approach or qualitative approach used by themselves (Newman & Benz, 1998). Underlying both paradigms used was a similarity in fundamental values: a “belief in the value-laden-ness of inquiry, belief in the theory-laden-ness of facts, belief that reality is multiple and constructed, belief in the fallibility of knowledge, and belief in the under-determination of theory by fact” (Tashakkori & Teddlie, 1998, p. 13).

The benefits of such a mixed methodology were many: The use of both quantitative and qualitative methods allowed us to learn the “why” and “how” of quantitative student responses. In addition to enabling the researcher to triangulate findings, the use of a combination of methods also allowed us to “demonstrate convergence in results...examine overlapping and different facets in order to examine contradictions and new perspectives and to add scope and breath to a study” (Cresswell, 1994, p. 189).

In approaching the design of this study I viewed the Vanguard Program as having a distinct culture with values, behaviors, and meanings that could only be understood *through the lens of the environmental context in which its participants experienced it*. In its broadest interpretation, culture refers to “...all that humans learn, in contrast to that which is genetically endowed (Keesing & Keesing, 1971, p. 20). What is learned is divided into patterns *of* behavior and patterns *for* behavior. Patterns of behavior are observable and frequently are referred to as social structure or social organization (see Keesing & Keesing, pp. 24-25). Patterns for behavior are seen as mentalistic phenomena, systems of ‘standards for deciding what is, standards for deciding what can be, standards

for deciding how one feels about it, standards for deciding what to do about it, and standards for deciding how to go about doing it' (Goodenough, 1971, pp. 21,22). Culture is also used to refer both to patterns of behavior and patterns for behavior" (Jacob, 1987, p. 11).

The Vanguard Program had not been previously studied or described, and thus this research study was an exploratory one utilizing a qualitative frame of inquiry to build an understanding of the Vanguard program and its role in retaining students through a process of inductive reasoning.

Qualitative methods share several assumptions: (a) a holistic view which seeks to understand phenomena in their entirety in order to develop a complete understanding of a person, program, or situation; (b) an inductive approach in which the researcher does not make assumptions about the interrelationships among the data prior to making the observations; and (c) naturalistic inquiry, a discovery-oriented approach in the natural environment (Rudestam & Newton, 1992). It was believed that a qualitative framework of inquiry would better allow for the emergence of patterns and was also better suited to facilitating an understanding of the program using the experiences and voices of the participants as data.

Although a qualitative framework was better suited to construct an experientially-based understanding of the NACME Vanguard Program, the broader policy and practice implications of a study of the NACME Vanguard program lay in the area of student retention, an area traditionally examined through the use of quantitative data such as SAT scores, high school GPA and class rank, college retention scores and college GPA. Throughout this study, I have used quantitative data to document aggregate program

information, to codify survey responses, and to support and reinforce data gathered about the student participants obtained through qualitative methods. Because data was gathered from multiple sources and through multiple methods I believe that both the reliability and validity of the study were increased.

Research Site

Drexel University was chosen as the site for the study. As the site with the largest number of NACME Vanguard participants over the longest number of years, Drexel had almost one third of the total population of NACME Vanguard Scholars. Second, the researcher had a long- established role within the program that allowed access to both current and former students and program administrators. Lastly, issues of cost and convenience indicated that a greater number of participants could be included in the study using this site as the focus.

Population of the Study

Eighty-four individuals comprised the study population enrolled as Vanguard Scholars between September 1996 and June 2002. However, since one scholar had died, there was a maximum of eighty-three potential respondents: thirty-one graduates, eight transfers, six dropouts, two stop-outs and forty-one currently enrolled scholars. Current addresses were not able to be located for ten individuals and one additional person without access to mail or Internet, was not able to participate. Thus, the final study population consisted of seventy-two current and former scholars.

Design of the Study

The guiding method used for this research study was that of a case study examining the single phenomenon of the NACME Vanguard Program as it currently

operates within the cultural context of a single environment: Drexel University. Case study methodology, appropriate for an exploratory study, allowed for the use of a variety of methods, and multiple methods were used to allow for the construction of an understanding of the NACME Vanguard Program, and the success strategies of Vanguard Scholars.

The particular approach selected was that of a Mixed Method Equivalent Status Sequential Design (Tashakkori & Teddlie, p. 15), utilizing a two-stage study.

Stage One

The first phase of the study consisted of an Internet-based survey of all students who enrolled at Drexel University as Vanguard Scholars between the 1996–1997 and 2001–2002 academic years.

Survey instrument: The researcher constructed a survey containing 111 items (Appendix B) to elicit data in three areas of study: pre-college characteristics of Vanguard Scholars, college achievement and retention data relative to Vanguard Scholars, and factors related to the Vanguard program and the university environment which students believed contributed to their college persistence. Topics covered by the survey instrument included thirteen variables that had been identified within the literature review as having an impact on student retention: a) non-cognitive factors, b) family characteristics, c) parental and peer support, d) high school preparation, e) personal commitment to educational and career goals, f) university climate, g) level of financial support, h) relationship to faculty and staff, i) campus participation, j) membership in a cohort, k) living within the campus community, l) participation in undergraduate research, and m) the utilization of academic and social support services. Demographic information

included within the survey included race/ethnic background, and gender, as well as class level, high school and college GPA, SAT/ACT scores, family income and parental education.

Although the majority of the questionnaire was constructed to elicit a range of opinions using Likert-scale responses, seven open-ended questions were asked:

1. I believe that I was chosen as a Vanguard Scholar because...
2. I believe that I have succeeded where others have failed because...
3. Please list three goals that you have for yourself right now.
4. Please list three things that you are proud of having accomplished.
5. Please list offices held and/or groups belonged to in college or in your community.
6. Can you sum up how your selection as a Vanguard scholar and your participation as a Vanguard Scholar has impacted your college success and your life so far?
7. Is there anything more about the Vanguard program that you would like to share that we have not asked?

The format of the questionnaire and content validity of the instrument were developed by reviewing literature and similar questionnaires related to the college retention of African American and Hispanic students in predominantly white institutions (Maras, 2002; Friess-Britt, 1994; Blockus, 2000). A literature research questionnaire matrix (Table 6) was developed to document the content validity.

Non-Cognitive Questionnaire: The NCQ (Non-Cognitive Questionnaire), (Tracey and Sedlacek, 1984), was incorporated in its entirety into the survey instrument and used to

elicit data concerning eight non-cognitive personality factors believed to predict college success: a) positive self-concept; b) realistic self-appraisal, especially regarding academic abilities; c) ability to understand and cope with racism, d) preference for long-term goals over short-term goals, e) acquired knowledge in a non-traditional area, f) successful leadership experience, g) demonstrated community service, and h) availability of a strong support person to turn to in crisis (Sedlacek, 2004).

The NCQ contains 29 items: 18 Likert Scale items, two multiple choice items pertaining to educational aspirations, three open ended questions related to current goals and past accomplishments, and six items related to demographic information. Possible scores vary among the eight scales. “Test-retest and coefficient alpha reliability estimates have ranged from .70 to .94, with a median test-retest reliability of .85 (Tracey & Sedlacek, 1984) and a median coefficient alpha of .83 ” (Sedlacek & Adams-Gaston, 1992).

Exemption from IRB review: Because the researcher served in an official capacity to the Vanguard Program and would have been well known to respondents, her identity as researcher was disguised in order to minimize potential coercion, and the survey was administered anonymously under the auspices of the Office of Institutional Research. In addition, all participant responses were anonymous, with no ability on the part of the researcher to identify individual respondents. Because of these protections the study was determined to be exempt from review from the university Institutional Review Board.

Notification: A letter inviting current and former Vanguard Scholars to participate in the research was sent via first-class U.S. mail by the Office of Institutional Research, to the last known permanent address of all Vanguard Scholars enrolled at Drexel University between 1996 and 2002 (see Appendix A). The letter outlined the purpose and scope of the research project, described the two data collection instruments—a survey and a focus group interview, and invited them to participate as a respondent in the study.

Respondents were assured that both the survey and the focus group interviews would be completely confidential and that their identities would not be able to be traced or identified by the researcher. Scholars interested in participating were asked to return a form to the Office of Institutional Research with their name, current mailing address and current valid e-mail address. Letters were sent to a total of 83 potential respondents; eleven letters to individuals were returned, “Address Unknown”. On the basis of the responses E-mail was sent to 72 known respondents with directions for accessing the secure server and the survey instrument.

All respondents who provided a valid e-mail address were mailed a \$10.00 Amazon.com gift certificate. Two weeks following receipt of valid contact information, instructions for accessing the Internet survey were sent to the e-mail addresses specified by the potential respondents (see Appendix B). The e-mail reiterated the purpose of the research study, and specified the approximate amount of time needed to complete the survey. The letter emphasized the voluntary nature of the study and the respondent’s ability to refrain from participation, and provided detailed instructions for accessing and responding to the survey. A second e-mail was sent to all participants two weeks later urging participants who had not yet responded to the survey to do so. Three weeks

following the first response, a second follow-up letter was sent to all respondents, including the \$10 gift incentive, and again urging participants to respond to the survey.

In the same package as the \$10 incentive, and the follow-up letter, a letter was mailed to all potential respondents, inviting them to participate in stage two of the study—a focus group interview (see Appendix C). The letter offered participants an opportunity to participate in one of two focus groups in Houston, TX and Philadelphia, PA, and gave instructions for respondents to register using a made up identifier that preserved their anonymity yet allowed the researcher to schedule manageable groups for discussion. Two experienced interviewers, unknown to the participants and not related to either Drexel University or the Vanguard program were selected as focus group facilitators.

Survey Administration: A Web-based survey was chosen as the instrument of choice for several reasons:

- 1) It was believed that this form of survey would be more likely than a paper survey to be completed by a group of technologically proficient respondents.
- 2) The location of the respondents, in several states and at least one foreign country, required a survey instrument that could be uniformly accessed and returned.
- 3) A Web-based survey greatly facilitated data collection, coding and analysis.

Survey Response Rates: One concern surrounding the use of an anonymous survey instrument, mail or web-based, was the anticipated response rate. Historically, response rates to survey instruments vary widely. In an examination of 15 articles using mailed surveys published in business, sociology, and psychology journals between 1960 and

1982, Chiu and Brennan (1990) reported response rates between 10% and 80%, and in a meta-analysis of 93 research studies, Yu and Cooper (1983) reported an average survey response rate of 47% to mailed surveys. Web-based surveys are a much more recent methodological tool, and there has been little research on response rates. However, in a recent study Sax, Gilmartin and Bryant (2003) examined response rates to the same survey using different paper and Web-based administrations and found the following response rates: a) paper only: 22%; b) paper with Web option: 24%; c) Web-only with response incentive: 17.1%; d) Web-only without response initiative: 19.8% (Sax, Gilmartin & Bryant, 2003, p. 417).

In order to maximize response rates, Chiu and Brennan (1990, p. 13) suggested the following:

- 1) Provide preliminary notification by mail or telephone before administering the survey;
- 2) Use a cover letter signed by a person of importance to the respondents;
- 3) Use a follow-up letter or postcard.

In this study, the first two methods were combined, and a follow-up letter was sent in order to increase the response rate to the Web-based survey:

- 1) Prior to administration of the survey, all potential respondents were sent a letter, signed by an individual within the administration known to be supportive of minority students, inviting them to participate in both phases of the study.
- 2) A follow-up letter was sent to all potential respondents, reminding them to complete the survey on-line.

In addition to the above methods, the \$10 gift certificate sent to all potential respondents serve as a thank you for their participation and an incentive to complete the survey.

Data Collection: The survey was placed on a secure server administered by Agile Solutions, Inc., an educational research company not affiliated with either the university or the researcher. Informants were able to respond to the survey from any computer with Internet capability, anywhere in the world, using a secure password that each respondent developed for himself or herself. This data collection tool (Charnitsky, 2002) provided complete anonymity to participants. Although students logged into the Website using an E-mail address and password, these were stripped from the data prior to being sent to the researcher. In the data report supplied to the researcher, only a sequential number identified participants. This data collection tool was particularly appropriate because it:

1. Required validation by the participant
 2. Eliminated duplicate survey responses from the same participant
 3. Provided the researcher with survey completion information, and
 4. Provided the researcher with demographic information on each respondent such as: Age, race, gender, community of origin, college major, and GPA.
- (Charnitsky, 2002).

During Stage One, Vanguard program documents and college based student retention data were also examined and quantified. In particular, standard data such as high school GPA and SAT scores, and college grades and patterns of retention were examined to see if there were apparent differences between Vanguard scholars who had remained at Drexel, and those who had left prior to completion. This data was also used

to compare differences in the academic performance of Vanguard scholars and that of their minority and majority colleagues.

Stage Two

Building on aggregate data gathered through the survey, Stage Two focused on developing an understanding of the program and its role in student retention through the use of qualitative data. Focus group interviews were used to develop an in-depth understanding of issues raised through the survey instrument administered in Stage One. In order to maximize scholar participation, two focus groups were held, one in Philadelphia, Pennsylvania and one in Houston, Texas, the home of one-third of the Vanguard scholars. Again, the identity of the researcher was disguised from the participants, and respondents participated anonymously, identified only by a letter. Two interviewers with extensive interviewing experience but no previous connection to either Drexel University or the Vanguard program were used to facilitate discussion. The researcher developed the interview protocol (see Appendix D) that was followed verbatim, and was audio taped. Data gathered through the focus groups was transcribed using a commercial transcription service, analyzed to elicit patterns of response, and quantified to develop an understanding of the context in which the Vanguard program operates at Drexel University, and its role in promoting student retention. All potentially identifying information volunteered within the focus groups was scrubbed from the focus group transcripts.

Although the framework of an exploratory case study precluded the development of hypotheses to be tested in the course of research, a survey of the literature led to the formation of an informal working hypothesis that I brought to this study: that both

personality factors and campus-specific social environmental factors explain a part of the phenomenon of minority student retention in college. Further, although I believed that pre-college characteristics can be important determinants of college success, I also believed that successful college students, who come to college without the pre-college characteristics associated with college success, develop equivalent characteristics *while in college by* interacting with peer and faculty mentors and by accessing compensatory programs within the college environment.

Table 7.

Vanguard Research Matrix

Factors that contribute to the retention of Minority students in STEM majors

Survey Question #	Literature Citation	Dissertation Question Addressed	Statistics Run on Survey Question
1. Being a part of the Drexel Vanguard program has been Important to my success		Question 3	Mean, SD,
2. This university is committed to creating a successful environment for Vanguard Scholars	Friess-Britt, 1994 Eaton & Bean, 1995 Gloria, 1992 Newman & Newman, 1999 McNairy, 1996 Sedlacek, 1999	Question 3	Mean, SD,
3. This University is unbiased in the treatment of minority students	Bean, 1980 Gloria, 1997 Newman & Newman, 1999 Gonzalez, 1997 Sedlacek, 1999 McNairy, 1996	Question 3	Mean, SD,
4. This University is more supportive of Vanguard scholars than of other minority students	Tinto, 1975 Astin, 1975	Question 3	Mean, SD,
5. Minority perspectives are values at this university	Bean, 1980 Gloria, 1997 Newman & Newman, 1999 Gonzalez, 1997 Sedlacek, 1999 McNairy, 1996	Question 3	Mean, SD,
6. This University is committed to the graduation of Vanguard Scholars	Tinto, 1975 Astin, 1975	Question 3	Mean, SD,
7. If I had not been selected as a Vanguard Scholar, I would have attended college anyway	Castaneda, et. Al, 1999 Georges, 1999 Stampen & Carbrera, 1986	Question 2	Mean, SD
8. The Vanguard Scholarship made the difference between coming here and going somewhere else.	Stampen & Carbrera, 1986 Castaneda et al, 1992 Georges, 1999 Fenske, Porter & Dubrock , 2000	Question 2	Mean, SD

Table 7 (continued)

9. All I needed to be successful was the scholarship'' nothing else was necessary.	Chenoweth, 1999 Stampen & Carbrera, 1986 Fenske, Porter & Dubrock, 2000 Georges, 1999	Question 2	Mean, SD
10. Being part of the Vanguard group has been important to my college success.	Seymour & Hewitt, 1997 Wehlage, Rutter, Smith, Lesko & Fernandez, 1988 Bullough et al, 2001 Tinto, 1996	Question 3	Mean, SD
11. Many of my closest friends are/were Vanguard Scholars.	Bullough et al, 2001	Question 3	Mean, SD
12. Knowing other students that are going through the same things I am is helpful to me.	Potthoff, Batenhorst, & Fredrickson, 2001 Wehlage, Rutter, Smith, Lesko & Fernandez, 1998 Bullough et al. 2001	Question 3	Mean, SD
13. I have always been able to find someone on this campus to help me with my problems.		Question 3	Mean, SD
14. In college, I have gotten to know students with racial/ethnic backgrounds different from my own		Question 3	Mean, SD
15. There have been other minority students in most of my classes here.		Question 3	Mean, SD
16. I have at least one good friend who is of a different race than I am.	Broissoit, 1999 Pike, 1999	Question 3	Mean, SD
17. Living with other Vanguard Scholars has been helpful to my academic success.	Broissoit, 1999 Pike, 1999	Question 3	Mean, SD
18. Living with other Vanguard Scholars has Helped me get to know People on campus	Seymour & Hewitt, 1997	Question 3	Mean, SD

Table 7 (continued)

19. As a Vanguard Scholar, I have been able to meet and work with faculty	Astin, Tinto, 1999 Seymour & Hewitt, 1997 House, 2000 Pascarella & Terenzini, 1980	Question 3	Mean, SD
20. I believe that some faculty care about the success of Vanguard Scholars.	Friess-Britt, 1994 Seymour & Hewitt, 1997 House, 2000 Pascarella & Terenzini, 1980 Gonzalez, 1997	Question 3	Mean, SD
21. I can honestly say that at least one person on this campus cares about me and my success.	Blockus, 2000 Gonzalez, 1997	Question 3	Mean, SD
22. I have had the opportunity to do research as an undergraduate student.	Nagda, Gregerman, Jonides, 1998	Question 3	Mean, SD
23. The Vanguard program has helped me develop my leadership abilities.		Question 1	Mean, SD
24. Having a Vanguard advisor separate from my academic advisor has helped me stay on track.		Question 3	Mean, SD
25. While in college I have joined at least one of: NSBE, SHPE, SANS, Minorities in Medicine, DMAT.	Talbert, Larke & Jones, 1999 St. Omer, Sampon & Lee, 1999	Question 1	Mean, SD
26. University administrators know me and care about my success.		Question 3	Mean, SD
27. I have found individuals at college who have served as mentors and role models.		Question 3	Mean, SD
28. I have used SUCCESS and Student Support Services to increase my academic skills.		Question 1	Mean, SD
29. The Vanguard Summer Immersion really helped me to prepare academically.	Potthoff, Battendorf & Fredrickson, 1999 Bullough et al, 2001	Question 3	Mean, SD

Table 7 (continued)

30. The Vanguard Summer Immersion was a big help in getting me prepared for the college experience.	Potthoff, Battendorf & Fredrickson, 1999 Bullough et al, 2001	Question 3	Mean, SD
31. I have actively participated in NSBE, SHPE or SANS activities.	Talbert, Larke & Jones, 1999 St. Omer, Sampson & Lee (Undated)	Question 1	Mean, SD
32. The Summer Immersion helped to connect me to the university and to other students.	Marable, 1988 Seymour & Hewitt, 1997	Question 3	Mean, SD
33. I think that my SAT scores were a good predictor of my college success.	Fleming & Garcia, 1998 Fleming & Morning, 1998	Question 1	Mean, SD
34. Through the Vanguard program I have found mentors and role models that inspire me.		Question 3	Mean, SD
35. The Vanguard program has provided me with opportunities to give back to the community.		Question 1	Mean, SD
36. I am pretty satisfied with the quality of the close relationships I have with people here at school.	Carbrera et al, 1992	Question 3	Mean, SD
37. I don't know enough people here at college that I can let know the real me.	Sedlacek, 1999 Eimers & Pike, 1997	Question 3	Mean, SD
38. My family gives me lots of encouragement to do well in college.	Bean, 1980 Nora & Carbrera, 1996 Friess-Britt, 1994 Gonzalez, 1997 Carbrera et al., 1992	Question 2	Mean, SD
39. I have doubts about whether I will finish my college education at this school.	Sedlacek, 1996 Eaton & Bean, 1995 Newman & Newman, 1999	Question 1	Mean, SD
40. I am absolutely positive that I will graduate from this university.	Sedlacek, 1996 Eaton & Bean, 1995 Newman & Newman, 1999	Question 1	Mean, SD

Table 7 (continued)

41. I have career expectations that require that I complete my college education.	Sedlacek, 1996	Question 1	Mean, SD
42. I took the right math and science classes to prepare me to do well in college.	Campbell, Denes & Morrison, 2001	Question 2	Mean, SD
43. I think that my high school prepared me well for college.	Gonzalez, 1997	Question 2	Mean, SD
44. Going to college is sort of expected in my family.	Bean, 1980 Moller-Wong & Shelley, 1999 Tinto, 1975;1993 Sedlacek, 1996	Question 2	Mean, SD
45. My parents have had to sacrifice for me to achieve my dreams.	Bean, 1980 Nora & Carbrera, 1996 Sedlacek, 1996 Friess-Britt, 1994 Gonzalez, 1997 Eimers & Pike, 1997	Question 2	Mean, SD
46. I am completely committed to the goal of graduating from college.	Sedlacek, 1994	Question 1	Mean, SD
47. It is important to me that I earn my degree from this Institution.	Sedlacek, 1999	Question 1	Mean, SD
48. If I need to earn money, I will take time off from my Studies.	Sedlacek, 1999 Georges, 1999 Anderson, 1981	Question 1	Mean, SD
49. My faith helps me overcome the obstacles standing between me and my goals.		Question 1	Mean, SD
50. I work harder than other people to get what I want in life.	Sedlacek, 1999	Question 1	Mean, SD
51. When I put my mind to something, nothing can stop me.	Tracey & Sedlacek, 1984	Question 1	Mean, SD
52. My family's support is essential to my success.	Bean, 1980 Nora & Carbrera, 1996 Tracey & Sedlacek, 1984 Eimers & Pike, 1997	Question 2	Mean, SD

Table 7 (continued)

53. I've already achieved more than most; nobody will blame me if I don't finish my degree.	Sedlacek, 1999 Tracey & Sedlacek, 1984	Question 1	Mean, SD
54. I think that it's important to give back to the community.	Tracey & Sedlacek, 1984	Question 1	Mean, SD
55. When I encounter obstacles, I use my problem-solving skills to overcome them.	Tracey & Sedlacek, 1984	Question 1	Mean, SD
56. I entered Drexel in (Year)		Demographic data	Mean, SD
57. I am male/female	Bean, 1982 Astin, 1975 Tinto, 1975 Sedlacek, 2004	Demographic data NCQ Question 2	Mean, SD
58. My racial/ethnic background is:	Tinto, 1975 Astin, 1975	Demographic data NCQ Question 2	Mean, SD
59. If you checked Hispanic above, please identify your ethnic background.	Tinto, 1975 Astin, 1975	Demographic Data Question 2	Mean, SD
60. I was born in the United States.	Astin, 1993 Tinto, 1975	Demographic Data Question 2	Mean, SD
61. My mother's educational background is/was:	McGrath & Braunstein, 1997 NSF, 2000 Astin, 1993 Tinto, 1975 Nora, 1993 Friess-Britt, 1994 Gonzalez, 1997 Maras, 2000	Demographic Data Question 2	Mean, SD
62. My father's educational background is/was:	McGrath & Braunstein, 1997 NSF, 2000 Astin, 1993 Tinto, 1975 Nora, 1993 Friess-Britt, 1994 Gonzalez, 1997 Maras, 2000	Demographic Data Question 2	Mean, SD

Table 7 (continued)

63. When I entered the University, our family income was:	Astin, 1993 Tinto, 1975 Nora, 1993 Friess-Britt, 1994 Gonzalez, 1997	Demographic Data Question 2 Question 2	Mean, SD
64. My college major is/was:		Demographic Data Question 2	Mean, SD
65. My current academic status is:		Demographic Data Question 2	Mean, SD
66. I believe that I was chosen as a Vanguard Scholar because:		Question 1	Open Ended
67. I think that I have succeeded where others have failed because....:		Question 1	Open Ended
68. HS GPA	Tinto, 1975 Astin, 1975 Pascarella, Terenzini & Wolfe, 1986	Demographic Data Question 2	Mean, SD
69. MSAT	Fleming & Garcia, 1998 Fleming & Morning, 1998 Lawlor, Richman & Richman, 1997 Ting, 1998	Demographic Data Question 2	Mean, SD
70. VSAT	Fleming & Garcia, 1998 Fleming & Morning, 1998 Lawlor, Richman & Richman, 1997 Ting, 1998	Demographic Data Question 2	Mean, SD
71. SAT Total	Moller-Wong, Shelley & Mark, 1999 Fleming & Garcia, 1998 Fleming & Morning, 1998 Lawlor, Richman & Richman, 1997 Ting, 1998	Demographic Data Question 2	Mean, SD
72. # of math courses taken	Campbell, Denes & Morrison, 2001	Demographic Data Question 2	Mean, SD
73. # of college credits earned.	Stampen & Carbrera, 1986	Demographic Data Question 2	Mean, SD

Table 7 (continued)

74. # of advanced placement courses taken	Campbell, Denes & Morrison, 2001	Demographic Data Question 2	Mean, SD
75. I will be the first in my family to graduate from college	Astin, 1993 Tinto, 1975 Nora, 1993 Carbrera & Castaneda, 1993 Gonzalez, 1997 Maras, 2000	Question 2	Mean, SD
76. I think that my family is richer, poorer, average, than most.	Bowen & Bok, 1998 Astin, 1993 Eaton & Bean, 1995 Carbrera & Castaneda, 1993 Tinto, 1973 Nora, 1993 Gonzalez, 1997	Question 2	Mean, SD
77. While at this University I have had the opportunity to meet minority faculty & staff.	Nora, Kraemer & Itzen, 1997 Seymour & Hewitt, 1997	Question 3	Mean, SD
78. Being a Vanguard Scholar has helped me figure out the 'rules' that govern life at this institution.	Padilla, 1999 Sedlacek, 2004	Question 1	Mean, SD
79. Even though I have chosen a different path, my Friends continue to support Me and my goals.	Bean, 1980 Nora & Carbrera, 1996 Carbrera et al. 1992 Friess-Britt, 1994 Gonzalez, 1997 Eimers & Pike, 1997 Maras, 2000	Question 1	Mean, SD
80. I have found some faculty and staff at this university to be warm and caring	Talbert & Johnson, 1999	Question 3	Mean, SD
82. I have found some faculty and staff to be warm & caring.	Tracey & Sedlacek, 1984	Question 3	Mean, SD
83. I have often felt alone & isolated on campus.	Tracey & Sedlacek, 1984	Question 3	Mean, SD
84. The Vanguard program has helped me find a family away from home.	Tracey & Sedlacek, 1984 Sedlacek, 2004	Question 3	Mean, SD
85. How much education do you expect to get in your lifetime?	Tracey & Sedlacek, 1984 Sedlacek, 2004	NCQ/Question 1	

Table 7 (continued)

86. About 50% of university students leave college before receiving a degree. If this has, or should, happen to you, what would be the most likely cause?	Tracey & Sedlacek, 1984 Sedlacek, 2004	NCQ/Question 1	
88. Please list three things that you are proud of having accomplished.	Tracey & Sedlacek, 1984	NCQ/Question 1	
89. The University should use its influence to improve social conditions in the community.	Tracey & Sedlacek, 1984	NCQ/Question 1	
90. It should not be very hard to earn a B average in college.	Tracey & Sedlacek, 1984	NCQ/Question 1	
91. I get easily discouraged when I try to do something and it doesn't work.	Tracey & Sedlacek, 1984	NCQ/Question 1	
92. I am sometimes looked up to by others.	Tracey & Sedlacek, 1984	NCQ/Question 1	
93. If I run into problems concerning school, I have someone who would listen to me and help me.	Tracey & Sedlacek, 1984	NCQ/Question 1	
94. There is no use in doing things for other people, you only get short-changed in the long-run.	Tracey & Sedlacek, 1984	NCQ/Question 1	
95. In groups where I am comfortable, I am often looked up to as a leader	Tracey & Sedlacek, 1984	NCQ/Question 1	
96. I expect to have/am having a harder time than most students in college	Tracey & Sedlacek, 1984	NCQ/Question 1	
97. Once I start something I finish it	Tracey & Sedlacek, 1984	NCQ/Question 1	
99. I am as skilled academically as the average college student.	Tracey & Sedlacek, 1984	NCQ/Question 1	
100. I expect to/have encountered racism at the university	Tracey & Sedlacek, 1984	NCQ/Question 1	

Table 7 (continued)

101. People can pretty easily change my opinion even though I thought my mind was pretty Much made up on the subject.	Tracey & Sedlacek, 1984	NCQ/Question 1	
102. My friends and relatives didn't think I needed to go to college.	Tracey & Sedlacek, 1984	NCQ/Question 1	
103. My family always wanted me to attend college.	Tracey & Sedlacek, 1984	NCQ/Question 1	
104. When course tutoring has been made available at no cost I have attended regularly.	Tracey & Sedlacek, 1984	NCQ/Question 1	
105. I wanted a chance to prove myself academically	Tracey & Sedlacek, 1984	NCQ/Question 1	
107. I believe that I was chosen as a Vanguard Scholar because...		Question 1	
108. I think I have succeeded where others have failed because		Question 1	
109. Please list offices held and/or groups belonged to.	Sedlacek, 2004	Question 2	
110. Is there anything further that you would like to share about your participation in the Vanguard Program that we have Not asked?		Questions 1 & 3	
111. Lastly, Can you sum up how your selection as a Vanguard Scholar and your participation In the program has impacted Your college success and your Life so far?		Questions 1 & 3	

CHAPTER FOUR: RESULTS OF THE STUDY

Introduction

This chapter will present the statistical analysis of responses to closed-ended questions in the survey, and an informal analysis of the qualitative data gathered through the open-ended questions and the focus group interviews. Seventy-two potential respondents, for whom valid current contact information had been obtained, were invited to participate in the study in January 2004. A total of 49 (68.0%) surveys were completed by respondents and 12 individuals (16.6%) participated in one of the two focus groups conducted in Philadelphia, PA and Houston, TX in March 2004. Since it is believed that most, if not all, focus group participants also completed the Internet survey the study had an overall participation rate of 68.0%. Forty- five respondents answered 100% of the closed-ended survey questions; there were at least forty- two responses to each of the open-ended survey questions.

Throughout Chapter Four, results from the survey will be presented, and, in most cases, will be followed with one or more quotations from the open-ended questions or focus group that are either representative or illustrative of Vanguard responses. These qualitative data will be used to triangulate findings from the survey.

In analyzing the responses to both the Internet survey and the focus groups, it is important to note that results were positively biased toward the opinions of individuals who had either graduated from the university, or who were still pursuing undergraduate degrees, and may not have accurately reflected different (and presumably more negative) responses from individuals who had either terminated their studies prior to graduation or who had transferred to other colleges and universities. Of the 49 respondents to the

survey, 41 were from current students or alumni; 3 respondents indicated that they had stopped-out and intended to return; only one respondent indicated that he or she had transferred out of the program to another university, and 4 individuals declined to answer the question. No respondent indicated that he or she had left college and did not plan to return within the foreseeable future. Of the 12 focus group participants, 4 had graduated and 8 were current students. None had either left the university before graduation or had transferred to another university prior to graduation.

Survey and focus group responses may also have been biased in favor of the opinions of Hispanics who were over-represented among the respondents proportionate to their numbers in either the Drexel or NACME Vanguard programs. Table 8 shows a comparison of the ethnicity of Drexel University Vanguard scholars to the reported ethnicity of survey participants:

Table 8:

A Comparison of Ethnicity of Vanguard Scholars to Survey Respondents

	Drexel Vanguard scholars	Survey respondents
African American	51 (59%)	18 (40.0%)
Hispanic	22 (27%)	15 (33.3%)
Asian	4 (5%)	3 (6.7%)
Native Am/Pacific Islander	3 (3%)	2 (4.4%)
Caucasian/non-Hispanic	5 (6%)	4 (8.8%)
Mixed ethnicity	N/A	2 (4.4%)
No Answer	N/A	1 (2.2%)
No response/other	N/A	1 (2%)

African Americans were under-represented in survey participation while Hispanic students were over-represented. The survey participation of Asian, Native American, and Caucasian students was roughly equivalent to their proportion of the total Drexel Vanguard population.

Of the focus group respondents, five (41.7%) were African American, five (41.7%) were Hispanic, one (8.3%) was Asian, and one (8.3%) was Caucasian.

Overview of Data Analysis

Triangulation

Contextual triangulation of the findings was achieved through the use of a) multiple respondents, and b) multiple methods of data gathering.

Multiple Respondents

There were a minimum of 42 respondents to each closed-ended survey question, and significant agreement among the respondents as evidenced by the small standard deviations calculated for each response. In addition, there were 16 focus group participants who provided an additional source and type of data, lending additional credibility to the findings.

Multiple Methods of Data Gathering

Data was gathered by using both a survey and focus groups; within the survey, data was gathered through the use of both closed-ended and open-ended response questions. Closed-ended questions provided quantitative data; open-ended response questions provided qualitative data. Two focus group interviews were held; these two sessions yielded more than 2,700 lines of qualitative data. All study findings were supported by data from two or more of the following data gathering methods: closed-ended survey question, open-ended survey question, focus group interview. As reported by Webb et al (1966, p. 3) as found in Lincoln & Guba (1985):

Once a proposition has been confirmed by two or more measurement processes the uncertainty of its interpretation is greatly reduced. The most persuasive evidence comes through a triangulation of measurement processes. If a proposition can survive the onslaught of a series of imperfect measures, with all their irrelevant error, confidence should be placed in it. (Lincoln & Guba, 1985, p. 306).

Internet Survey

The survey consisted of a total of 111 questions of which 98 were closed-ended questions and 13 were open-ended questions. Of the 98 closed-ended questions, there were 62 questions that elicited responses along a five-unit Likert scale, 20 yes/no questions, and 16 multiple-choice questions. The 29 items of the Non-Cognitive Questionnaire (NCQ) developed by Dr. William Sedlacek and designed to assess non-cognitive qualities (Sedlacek, 2004, pp. 168-174) were imbedded in the survey instrument. Responses, percentages, means and standard deviations were computed for each closed-ended question. Open-ended questions were informally analyzed, and used to triangulate results from the closed-ended survey questions.

Focus Groups

Twelve individuals participated in one of two focus groups held in Philadelphia, PA, and Houston TX. Focus group participants were anonymous; however the two focus group facilitators gathered racial and gender data for all participants. The focus groups were audio taped, then transcribed by a commercial transcription service that deleted all identifying information from the written transcription record. The data were then informally analyzed and categorized by the researcher. Focus group statements were used to triangulate the findings of the survey.

Table 9 shows the racial and gender breakdown of focus group participants.

Table 9:

Race and Gender of Focus Group Participants

Race	Total	Houston		Philadelphia	
		Male	Female	Male	Female
African American	5	1	1	2	1
Hispanic	5	1	3	1	0
Asian	1	1	0	0	0
Caucasian	1	0	0	1	0
Total	12	3	4	4	1

The two focus groups followed a scripted series of 12 questions that were intended to provide illustrative data about the three research questions for which the survey had provided quantitative data: pre-college characteristics of Vanguard Scholars, non-cognitive abilities, and social environmental factors that had impacted the respondents' academic achievement and college retention. There were a total of 288 statements made that were relevant to the study. Thirty- two (11.1%) statements referred to pre-college factors, 144 (50%) statements concerned non-cognitive factors, and 102 (38.8%) referred to the social environmental environment on campus.

An analysis of these responses is found in Table 10.

Table 10

Analysis of Focus Group Responses

<u>Category:</u>	Group 1: Houston <i>n</i> = 7		Group 2: Philadelphia <i>n</i> = 5
	<u># of statements</u>	<u>Rank</u>	<u># of statements</u>
<u>Pre-College Factors</u>			
HS Prep for college	5	10	9
Socio-economic Stat.	3	17	2
Race	8	7	2
High School major	1	23	1
Family education	1	23	0
Total-Pre-College Statements	18		14
<u>Non-Cognitive Factors</u>			
Self-Concept	13	3	21
Self-Appraisal	3	17	3
Understands System	16	1	11
Preference for L/t goals	4	15	9
Availability strong support	14	2	14
Leadership	1	23	1
Community service	13	3	8
Knowledge acquired in field	5	10	5
Total Non-Cognitive Statements	72		72
<u>Social/Environmental Factors</u>			
Scholarship	12	5	9
Summer Immersion	4	15	11
Shared Housing	5	10	1
Cohort Experience	7	8	14
Student Support	11	6	9
Coop	3	17	2
Access to faculty/staff	5	10	9
Undergraduate research	3	17	0
Peer tutoring/Study groups	6	9	3
Advising	5	10	0
Mentors	1	23	5
Student Organizations	3	17	7
Total Social Environmental Statements	64		48
Total Number of Statements	154		134
Average # of statements/participant	22		27

Research Question One: Pre-College Factors

What do individuals, selected as Drexel Vanguard Scholars perceive as the pre-college factors that contribute to the high graduation rates of students in the program? How much importance do students ascribe to such factors as socioeconomic status, parental education, family characteristics, the support of parents and peers, and high school preparation?

The assumption underlying this question was that if successful Vanguard scholars possessed the background characteristics positively associated with academic success and college retention, this would explain their higher than average college retention and graduation rates. Using this assumption, Vanguard Scholars who had already graduated or were still pursuing their undergraduate degrees would be expected to come from more affluent families, would have parents who were college educated, would have had excellent high school grades and better than average SAT scores, and would have completed a rigorous high school curriculum of advanced science and mathematics. These were background characteristics identified in the literature positively associated with academic success and college retention. The literature also showed that these characteristics were not generally reflective of the experience of African American, Hispanic and American Indian students as a whole.

Results of this study do not support this assumption. In large measure, the academic success and college retention of Vanguard Scholars could not be anticipated based on their pre-college characteristics.

On the contrary, the study found that Vanguard respondents possessed background and pre-college characteristics similar to those of African American,

Hispanic and American Indian college students as a whole as described by the research literature. Respondents defined themselves as being economically “disadvantaged,” and would have been considered less likely, based on their background characteristics to either attend college, or be successful once admitted. They saw their backgrounds as something to be overcome and compensated for. Based on their responses, one would not have expected either higher than average academic success, or college retention:

Socioeconomic Background

Forty respondents (88%) described themselves as coming from either low-income or middle-income families. Only two respondents (4%) described themselves as being from families with higher than average incomes. For many respondents, particularly those from low-income families, receiving a scholarship meant the difference between attending or not attending college; nine respondents (20%) indicated that the Vanguard Scholarship had made college financially accessible, and that they would have been unable to attend college without it. Two applicants described the impact of the scholarship in the focus groups: “The Vanguard scholarship (made me start) believing I was going to go to college... I applied and was accepted to other colleges, but I would have never been able to afford going to any of them” (Focus group, lines 1463-1472). And, “I wanted to come to school. I’ve always wanted the opportunity and Vanguard gave me the opportunity to go to this school and not have to worry about the cost” (Focus group, lines 2265-2268).

Even for students from somewhat higher income families, receiving the Vanguard scholarship played a major role in their selection of a college. Fully 90% of the respondents indicated that receiving the Vanguard scholarship was the determining factor

in their selection of Drexel as their college of choice: “I never heard of Drexel until I got (the Vanguard scholarship), and then out of all of the schools on the NACME list...Drexel was the best one so it’s the only reason why I went here” (Focus group, lines 82-85).

Racial/Ethnic Background

There were forty-five responses to the question about racial/ethnic background. Eighteen respondents (40%) described themselves as being either African American, or of a multiracial background that included African American. Fifteen individuals (33%) described themselves as being Hispanic. Of these fifteen, the vast majority was Mexican (11/73%) followed by Puerto Rican (3/20%), Ecuadorian (2/13%), and one each (6%) from El Salvador, Costa Rica and Dominica. Because some individuals identified themselves as being of more than one Hispanic culture, the numbers add up to more than 15 and the percentages add up to more than 100%.

The remainder of the respondents described themselves as being Caucasian/non Hispanic (9%), Asian (6%), or Native American/Pacific Islander (4%). Thus, of the 43 survey respondents, 85% were from racial/ethnic populations underrepresented in engineering and technology-related disciplines.

Parental Education

The educational level attained by the parents of Vanguard scholars was generally reflective of socioeconomic background. On the whole, the parents of Vanguard scholars had considerably less formal education than parents of other students attending Drexel University. Five (11%) respondents indicated that both parents had less than an eighth-grade education and ten (22%) reported at least one parent with less than a high school

diploma. At the other end of the educational spectrum, ten scholars (22%) responded that their mother had earned a bachelor's degree, and 11% had a mother who had earned a graduate degree. Fifteen percent of the respondents' fathers were college graduates and 13% had earned graduate degrees. Two-thirds of the respondents described themselves as being first-generation college attendees. Table 11 shows the parental education level for all respondents:

Table 11
Parental Educational Level

	Mother <i>n</i> = 43		Father <i>n</i> = 41	
Less than 8th grade	5	12%	5	12%
Some high school	3	7%	5	12%
High School graduate	11	26%	10	24%
Some college	10	23%	8	20%
College graduate (B.S./B.A.)	10	23%	7	17%
Graduate degree	4	9%	6	15%
Total	43	100%	41	100%

As can be seen from Table 11, 12% of respondents' mothers had no high school, 33% had attended high school, and 55% some college or more; 12% of respondents' fathers had less than a high school education, 36% some high school or a high school diploma, and 52% some college or more.

High School Preparation

The majority of respondents (30 respondents/66%) reported that, in their opinion, their high school had prepared them well academically for college. Thirty-one students (68%), responded that they had taken the correct mathematics and science classes to prepare for college. Thirty-five (77%) survey respondents indicated that they had taken

advanced placement courses in high school, and forty (88%) had taken four or more mathematics courses. Nevertheless, they felt socially and emotionally unprepared for the college experience: “I went to a technical (high school), four years of math, four years of science, four years of English, a foreign language and...academically I was prepared to come to school. I was prepared for the material. What I wasn’t prepared for was the freedom that you get when coming to school and the way that the college system is structured.” (Focus group, lines 1696-1707).

Respondents reported that they experienced external pressures to do well and succeed while in high school. In college, there was a recognition that the push to do well needed to come from within themselves: “I feel that I was very prepared, but whether I succeeded was really based on my individual efforts...if I did well, it was really based on me...or thinking that I can do it” (Focus group, lines 176-181).

However, there was a significant minority of nine students (19%) who reported that they felt shortchanged by their high school experiences, and, as a result, struggled to achieve academically. “My high school didn’t offer calculus...When I went to the Immersion...I knew what exponents were and some of that stuff and a little bit of calculus, but I was completely lost throughout the whole math portion” (Focus group, lines 1737- 1745). These students looked upon the university environment to play a more active role in their academic success.

High School Grade Point Average (GPA)

As predicted by the research literature, high school grade point average (GPA) was a good predictor of college success. Of the 42 respondents who self-reported a high school GPA, 14 reported GPA’s of 4.0 or higher (a score made possible by Advanced

Placement or Honors courses), 22 reported GPA's between 3.0 and 3.99, and six reported high school GPA's below 3.0. The lowest reported GPA was 2.5, and the average for all respondents was 3.60.

SAT and Standardized Test Scores

As illustrated in Table 12, SAT scores of African American and Hispanic Drexel Vanguard scholars closely paralleled the average SAT scores for all freshmen entering Drexel University and ranged from total SAT scores of 900 to 1560.

Table 12:

Comparison of Average Vanguard SAT scores to Average Freshman SAT scores by Cohort

<u>Year of Entry</u>	<u>Drexel Freshmen*</u>	<u>Vanguard Freshmen</u>
1996	1122	1120
1997	1133	1101
1998	1133	1042
1999	1158	1185
2000	1144	1140
2001	1156	1200
2002	1182	1095
2003	1201	1075

*Data received from Drexel University, Office of Enrollment Management

Level of Educational Aspiration

One large difference between Vanguard Scholars and the overall college population was the level of educational achievement that they expected to achieve during

their lifetimes. Of the 39 individuals who responded to the question by listing a specific educational level they hoped to achieve, only three (7.7%), expected to complete their education with a bachelor's degree (B.A. or B.S.). Thirty- six respondents (92%) expected to earn advanced degrees. Eighteen respondents (46.1%) expected to earn a masters degree; seven (17.9%) expected to earn a Ph.D.; three (7.7%) expected to earn a medical degree (two in combination with a Ph.D.); and four (10.2%) expected to earn a degree in law (J.D. or LL.B.).

Research Question One: Summary of Results

As was expected, the higher –than- average college retention and graduation rates of Vanguard Scholars could not be explained on the basis of pre-college characteristics traditionally associated with college success. On the whole, Vanguard scholars come from under-represented minority backgrounds, are from low and middle- income families, and are in the first generation of their family to attend college. They have adequate high school preparation for academic subjects (though not for the social reality of the university), and they have slightly below-average SAT scores. What does distinguish Vanguard Scholars from their peers is their level of educational aspiration, with 93% stating an intention to pursue a graduate degree. Analysis of the results for Question Two that follows indicates that this may be related to their possession of non-cognitive abilities not generally measured by admissions protocols.

Research Question Two: Non-Cognitive Abilities and Personality Factors

What do Drexel Vanguard Scholars perceive as the non-cognitive abilities or personality traits that contribute to academic success and college retention? How do they explain their ability to persist despite the lack of traditional factors associated with college success?

A focus of analysis for this question focused on the participants' responses to (a) the Non-Cognitive Questionnaire (NCQ) items included in the Internet survey; (b) survey questions generated by the researcher about the reason they had been selected for participation in the program and (c) survey questions about the factors to which respondents attributed their academic success. Since high scores on the NCQ have been positively correlated with college success, underlying this series of questions was the assumption that Vanguard Scholars would have high scores on the NCQ. In addition, there was interest in learning which of the eight non-cognitive qualities identified by William Sedlacek Vanguard Scholars would consider as most contributory to their success.

Impact on Vanguard Scholar Selection

Several respondents recognized that their selection as Vanguard Scholars had been based on a more holistic assessment that took into account both cognitive and non-cognitive abilities. "The Vanguard Assessment takes into consideration the student as a person aside from the numbers. Anyone who has met me in the last three years can tell I'm intelligent, ambitious, and determined. All these things that can't be obtained by SAT, ACT, or whatever other numbers universities use.... What makes a Vanguard Scholar is...rather more intrinsic qualities that are needed in people that will be looked to

in the future as leaders. I believe I was chosen as a Vanguard Scholar because they judge students based on the student as opposed to the numbers” (Survey response, question # 107).

The Non-Cognitive Questionnaire (NCQ)

The Sedlacek Non-Cognitive Questionnaire (NCQ) was imbedded into the Internet survey, and coded according to the directions in Appendix E. For each of the eight sub-scales within the NCQ the group mean and standard deviation were calculated. In his most recent work, William Sedlacek has also calculated the t-score for each population that has been administered the NCQ test. In order to be able to compare the NCQ scores for the Vanguard Scholars to the scores of other student populations, the researcher also calculated a t-score for each sub-scale. According to Agresti & Finlay, “*T* table(s) (have) *df* values only below 30, and for larger values the *T*-scores are practically identical to *z*-scores” (1997, p. 187). For this study, a T-score equivalent comparing Vanguard Scores to norms for African American respondents was determined by entering the mean raw score into the table shown in Appendix F. T-scores have a mean of 50 and a standard deviation of 10.

In addition to the NCQ, the survey included additional questions, developed by the researcher, designed to elicit responses about non-cognitive abilities. These questions were informally analyzed to provide raw scores, percentages in each response category, means and standard deviation. Results from these questions will be used to illustrate findings from the NCQ where applicable.

These results are presented in Table 13:

Table 13:

Vanguard Scholar Scores on Non-Cognitive Questionnaire

Subscale:	Mean Score	SD	T-score
Academic Self-Concept	21.64	2.31	61
Realistic Self-Appraisal	10.62	2.08	60
Ability to Negotiate the System (Racism)	18.56	2.68	50
Long-Term Goals	10.06	1.52	52
Availability of Strong Support Person	13.30	1.77	47
Leadership	10.12	1.57	59
Community Service	6.65	1.19	62
Knowledge Acquired in a Field	5.11	.96	80

As a group, Vanguard respondents had average responses for college students on five of the eight subscales, and above average scores on four of the subscales: Academic Self-Concept, Realistic Self-Appraisal, Community Service, and Knowledge Acquired in a Field. A comparison of Vanguard scores to scores for two other samples that shared similar characteristics to Vanguard Scholars, (a) a special undergraduate program at a medium sized university ($n = 91$) (90% African American/10% White), and (b) a historically Black College ($n = 212$) (70% African American, 10% White, 12% International), may be seen in Table 14.

Table 14

NCQ Scale Means and Standard Deviations for Selected Samples

	Special Undergraduate Program, Medium-Sized University, 90% African American, 10% White (N=91)*		Historically Black College, 70% African-American, 10% White, 12% International (N=212)*		Drexel Vanguard Scholars, 38% African-American, 34% Hispanic, 6% Asian, 4% Native American, 9% White, 6% Other (N=44)	
NCQ Scale	Mean	SD	Mean	SD	Mean	SD
Self-Concept	14.13	2.61	19.71	2.13	21.64	2.30
Self-Appraisal	8.61	3.22	11.22	2.31	10.62	2.08
Racism	14.60	3.11	18.86	3.17	18.56	2.67
Goals	8.31	1.73	10.13	1.76	10.06	1.52
Support Person	11.67	2.00	13.88	1.79	13.30	1.77
Leadership	7.15	3.37	9.11	2.34	10.12	1.57
Community	7.32	1.66	7.65	1.66	6.65	1.19
	4.62	1.81	3.17	0.89	5.11	0.96

*Data taken from Sedlacek (2004, p. 178)

Positive Self-Concept

The NCQ defines *Positive Self-concept or Confidence* as: Strong-self feeling, strength of character, determination, and independence. Possible scores on the *Positive Self-concept* scale range from a low score of 8 to a high score of 26, with means for White and Black populations between 18 and 20.

High scorers feel confident of making it through graduation and make positive statements about themselves. They expect to do well in academic and nonacademic areas and assume they can handle new situations or challenges.

Low scorers express reasons why they might have to leave school and are not sure they have the ability to make it. They feel other students are more capable, and expect to get marginal grades. They feel they will

have trouble balancing personal and academic life. They avoid new challenges or situations” (Sedlacek, 1991, p77).

Vanguard respondents scored highly on *Positive Self Concept*, with a mean score of 21.64 (SD = 2.30) out of a possible score of 26. When compared to normative data for African American respondents, (see Appendix F), this score had an equivalent T-score of 61.

Triangulation for this finding was provided by the respondents’ answers to similar survey questions generated by the researcher and within the focus groups. Forty one (90%) respondents reported strong agreement (Standard Deviation (SD = .558) with the statement “I am completely committed to the goal of graduating from college” with only three (6%) responding ‘Neutral’ and one (2%) responding ‘Disagree’. Similarly, 78% reported strong disagreement (SD = 1.37) with the statement “I’ve already achieved more than most; nobody will blame me if I don’t finish my college degree”, with 9% responding ‘neutral’ and 11% responding ‘agree’. When asked what personality traits were shared by Vanguard scholars, the following response was given: “The general trait that (was) shared between everyone would be just the goal of wanting to succeed....they wanted to do something beyond staying where they were so they wanted to achieve something” (Focus group, lines 1547- 1554).

For some respondents, designation as “Vanguard Scholar” and receipt of a scholarship either begins or re-affirms a process of identification with a self-concept that includes academic excellence. In response to a survey question that asked respondents to list three things that they were proud of having accomplished, eight respondents (18.6%), mentioned “receiving the Vanguard Scholarship”, the single highest response.

For the majority of respondents, being a Vanguard Scholar meant incorporating an academic identity into a prior self-concept that included strong identification with family, community and peers. In their responses to open-ended questions and in the focus groups, there was an implicit evidence that respondents realized that they were intelligent. Responses indicated that although in the past respondents might have felt discouraged, they now realized that they possessed distinct academic capabilities: “All (Vanguard) students are determined students who are focused on their education, who care about their education and know the value of what it means to be a Vanguard Scholar” (Focus Group, lines 93-101). At the same time, the majority of respondents clearly saw themselves as breaking away from previous reference groups, reporting that they were proud of “Being alive after the age of 21,” “still being in school despite the incentive to give up,” and having “legal income” (Response to survey question # 88).

Some of these same respondents reported that they had to turn away from values and identities that they had had prior to college, and embrace a new identity in which academic success played a major role: “I don’t give myself the credit many people give themselves. I always feel that I should of or could of done better. Being selected for the Vanguard program helped me give myself more credit and think maybe I am good at what I do. In other words, it built up my confidence.” (Response to survey question #111), and “I know that I changed a lot since being introduced to NACME...Being a Vanguard scholar like really changed my whole outlook on who I was in general...Before I was Vanguard, I was really nobody to be really proud of” (Focus Group, lines 2452-2465).

For these respondents, remaining in school to whatever level they had achieved was a major success—e.g. “making my family proud by attending college” (Response to survey question #88) that contributed to the formation of a positive self-concept. As was evidenced by a holistic assessment of their responses within the focus groups and to the open-ended questions, Vanguard respondents remembered where they came from, clearly saw themselves as successfully straddling two very different worlds, and attributed their changed self-concept to their participation in the NACME Vanguard program: “all the programs are...building a relationship with you and who you want to be, so it’s helping you build yourself up” (Focus group, lines 393-395).

One interesting and related finding with relation to the creation of an academic self-concept was the meaning that study respondents ascribed to their participation in a national program, and the power that this designation had to positively alter their self-concept. Respondents in the present study ascribed great value to their selection as NACME scholars, almost as an *imprimatur* on their sometimes newly formed academic identity. As participating universities transition from a national NACME Engineering Vanguard program, to a university-specific recruitment and retention program for under-represented minority students, creating and maintaining a similar academic identity for participants will be a challenge. It is possible that establishing a ritual introducing new scholars to Vanguard alumni or minority professional organizations may help them form desired professional and academic identities.

Realistic Self-Appraisal Especially Academic

The NCQ defines *Realistic Self-Appraisal, Especially Academic* as:

Recognizes and accepts any deficiencies and works hard at self-development.

Recognizes need to broaden his/her individuality.

High scorers show evidence of influencing others in academic or nonacademic areas.

Low scorers show no evidence that others turn to him/her for advice or direction. Nonassertive. Does not take initiative. (Sedlacek, 1991, p. 77)

Possible scores on the Realistic Self-Appraisal Scale range from a low score of four to a high score of 14. Vanguard respondents scored a mean score of 10.62 (SD = 2.08; T-score: 60), on the Self-Appraisal scale. In their responses to open-ended questions in the survey and in the focus groups, respondents frequently cited hard work and determination as the factors that set them apart from their peers. In response to the question: "I think that I have succeeded where others have failed", one respondent wrote: "I keep trying and don't give up. I'm a hard worker and not necessarily the smartest worker. Persistence plays a great role in my success" (Survey response to question #108).

Similar comments were made in the focus groups: "I feel sometimes that the people not within (Vanguard) don't really understand how hard it may be for you to go to class and struggle through your work because, you know, it's tiring and ...you don't really feel like doing it" (Focus group, lines 417-422). And, "If you took the grade point average for our (Vanguard) dorm versus the freshman dorms, ours would have been...higher than everybody else's. You could see us every night studying at the little

table, you know, doing homework and stuff like that, and basically building a community where academics was important” (Focus group, lines 543-549).

For some Vanguard scholar respondents, self-appraisal appears to be a continuous process that shapes their emerging and reformulated self-concept: “I have gotten an opportunity to know more about myself as well as recognized what my source is as far as strength, courage and wisdom” (Focus group, lines 1069-1072). In turn, this change in self-concept appears to drive change in the formulation of long-term goals, and in the value of a college education in general: “I wanted to drop out as soon as I got here and then at least everyday since then, if not multiple times a day...there were times when I thought that my computer skills were exceeding my ability to learn. Like, I just thought that I was wasting my time sitting here in class doing nothing when I could be out in the field. I’ve changed my mind since then” (Focus group, lines 2248-2257).

Ability to Negotiate the System/ Handle Racism

The NCQ defines this concept as:

Realist based upon personal experience of racism is committed to fighting to improve existing system. Not submissive to existing wrongs, nor hostile to society, nor a ‘cop out’. Asserts school or organization role to fight racism. Asserts school role to fight racism. (Individuals with high scores) understand the role of the ‘system’ in his/her life and how it treats nontraditional persons, often unintentionally. Has developed a method of assessing the cultural/racial demands of the system and responds accordingly—assertively (Sedlacek, 1991, p. 77).

Possible scores on the *Ability to Negotiate the System* sub-scale range from a low of low score of 8 to a high score of 25. Vanguard respondents received an aggregate mean score of 18.56 (SD = 2.65, T-score = 50) on this variable. This score was within the average range of normative groups of African American respondents (Sedlacek, 2004, p. 177).

Although the Vanguard score for '*Ability to Negotiate the System*' is within the average range for Black respondents as defined by Sedlacek, it is at the low end of the scale. One possible explanation for this finding is that all Vanguard scholars are majoring in engineering or technology-related disciplines; they are students who have highly developed abilities in computational intelligence, but who may need to further develop their capabilities for accurately assessing an environment in which the rules are not explicitly stated.

In his most recent writings about the NCQ, Sedlacek discusses the two aspects of this sub-scale: "For traditional students, this non-cognitive variable takes the form of handling the system without the addition of racism" (Sedlacek, 2004, p. 43). And, "research has consistently shown that students of color who understand racism and are prepared to deal with it perform better academically and are more likely to adjust to a predominantly White school than those who do not" (Sedlacek, 2004, p. 43).

Respondents gave responses recognizing both aspects of the variable. A total of 37 focus group statements (12.8% of the total responses), addressed the need to effectively negotiate the university system in order to stay in school. The following responses were typical: "I know that if I wasn't a Vanguard, I would feel kind of lost" (Focus group, lines 522-523), and "Drexel has a system that is, when you get there, it's

not easy to just pick up...being in that system you have to learn a few things to get there and use the system, and when I speak of the system, I mean different policies that have been given to you but not explained” (Focus group, 737-741).

A somewhat surprising 58% of the respondents reported that the university was unbiased in the treatment of minority students ($SD = .908$). Ten percent and thirty percent were neutral. A potentially more revealing finding was that only 40% of respondents believed that minority perspectives were valued at the university ($SD = 1.077$) with 41% remaining neutral, and 16% citing negative responses. Reflective of the minority view that the campus was racist, one respondent wrote in response to a request for suggestions for improving the program that the university should “work hard to combat the racism that is on campus. Minorities are in much smaller numbers on campus...” (Response to survey question #110).

Respondents also recognized that the university’s changing racial demographics, with an increased number of under-represented and foreign students had changed the academic climate of the university: “There are so many foreign students at Drexel that if you’re American, you’re set. You don’t have to worry about people looking at you differently because you’re Black or Hispanic or something. It’s like speaking English well is a plus” (Focus group, lines 2111-2117).

However respondents felt that the university could and should do more to reach out to local minority populations. Thirty- nine respondents (86%) indicated that the University should use its influence to improve social conditions in the community. As expressed by one respondent: “ I hang out in the neighborhood, I’m from the neighborhood and people are like, wow, you know, how can my little brother or

sister...go (to Drexel), but if they're not an engineer, you know there's not much...I think that some opportunities could be put in place" (Focus groups, lines 2179-2187).

Preference for Long-term vs. Short-term Goals

According to the NCQ, students who are successful in college are able to work toward long-range goals and are "able to respond to deferred gratification" (Sedlacek, 1991, p. 76). Sedlacek considered this sub-scale is considered to be more important particularly in predicting persistence at the three and five semester levels (Tracey & Sedlacek, 1988), and in determining academic success among non-traditional students, including under-represented minorities. "Because suitable role models are often hard to find and the reinforcement system has been relatively random for them, many nontraditional students have difficulty understanding the relationship between current efforts and future outcomes" (Sedlacek, 2004, p. 44).

Possible scores of the *Preference for Long-Term vs. Short-term Goals* subscale range from a low score of 3 to a high score of 13. As a group, Vanguard scholars scored a mean score of 10.06 (SD = 1.52) on the Long-Term Goals scale with a T-score of 52 when compared to a normative group of African American students (See table 12). One focus group respondent spoke about the difficulty in setting personal and career goals that were very different from those of his high school peers, and the emotional conflict that he had struggled with as a result: "I think that a lot of individuals who come from my socioeconomic background find it difficult to put their lives to the side for five years and study something that they might never use and it really is very different from what they've known for a long time in their life" (Focus group, lines 2133-2138). Finding other individuals who were experiencing the same kinds of transitions made the process

easier: “What kept me (at Drexel) is it just seemed like everyone else was going through the same thing I was going through and like we all came here together, we were all picked together....if they can, I can” (Focus group, lines 2281-2298).

Leadership

The NCQ measures “successful leadership experience in any area pertinent to his/her background” (Sedlacek, 1991, p. 76). “Students of color and women who show evidence of leadership prior to matriculation in college, often in some form related to race or gender, are more likely to be successful students than those without such leadership experience” (Sedlacek, 2004, p. 46).

Possible scores on the NCQ Leadership sub-scale range from a low score of 3 to a high score of 13. As a group, Vanguard Scholars scored a mean of 10.2 (SD = 1.57) on the NCQ leadership scale (t-score =59). One typical response was: “I am a leader with an attitude that anything is achievable. Once I put my mind to something I make sure that I finish it. I have made myself a well-rounded person by being involved in different activities and trying to excel academically” (Response to survey question #107).

However, while Vanguard scholars may demonstrate leadership abilities, it is unclear whether participation in the Vanguard program has contributed significantly to their leadership capabilities. A total of twenty-seven scholars (59%) agreed with the statement: “the Vanguard program has helped me to develop my leadership abilities”. There is substantially more evidence that Vanguard scholars’ leadership capabilities were honed through their participation in student groups, although this group participation may have been the indirect result of their participation in the Vanguard program. Thirty eight (84%) of the respondents indicated that they had joined at least one minority-based

professional student organization. In addition, there is additional evidence from focus groups to suggest that some of this participation was the result of being forced to take a more active role in the management of their lives at the university:

One of the reasons why we organized and came up with SANS (Society for the Advancement of NACME Scholars), was because we needed a group...we found out...very quickly that ...while (the Vanguard advisor) was a great resource, her time was finite so she couldn't do everything. So we needed to come together and band together so...we got housing squared away, and financial aid squared away, ...and I think...that's it's very important being a different, special group who can unite underneath the Vanguard scholarship."

(Focus group, lines, 2672-2685)

Availability of Support Person During Crises

The NCQ defines this ability as "seeks and takes advantage of a strong support network or has someone to turn to in a crisis or for encouragement" (Sedlacek, 2004, p. 37). This ability is critical to minority student academic success and college retention, because, according to Mallinckrodt: "because of random reinforcement of the relationship between individual effort and positive outcome, a relatively small obstacle or set of obstacles may make a student of color drop out or fail school" (Mallinckrodt (1988) as cited in Sedlacek, 2004, p. 46).

Possible scores on the *Availability of a Strong-Support Person* subscale ranged from a low score of 4 to a high score of 15. Vanguard respondents scored an aggregate

mean score of 13.30 (SD = .77) on the NCQ, with a T-score of 47. When compared to other African American groups of respondents (see Table 12), this was a high score.

In the focus groups and in their responses to researcher-generated questions in the survey, many respondents addressed the importance of having a well-developed support system through the Vanguard program, and its' importance to their college retention and success. "Them being accessible to us whenever we needed them, well whenever I needed them was just a real, really, really important to my success" (Focus group, lines 1860-1863). The vast majority off the respondents (40 respondents /88%) agreed with the statement: "I can honestly say that at least one person on the Drexel campus cares about me and my success". Additionally, 32 respondents (70%) agreed that they were always able to find someone on the Drexel campus to help them with their problems, fellow Vanguard scholars, faculty or staff. "This program has given me the chance to have a support group consisting of students, faculty, and staff. This environment meets my personal needs in a way other universities could not. I think that this was the important factor in my success at Drexel" (Response to survey question #111).

Focus group participants concurred: (The Vanguard program) "gives you that sort of confidence in the faculty, in the school, in the staff to know that somebody, somewhere within the school, within the administration will help you no matter what your problem is, no matter how big, or how small" (Focus group, lines 379-385). Taken as a whole, focus group responses suggest that through the development of strong group cohesiveness (to be discussed further in Research Question Three), Vanguard Scholars have created for themselves the reliable, and consistent support network that is needed for college success and retention. As but one example: "The wonderful thing about

community with Vanguard scholars was that those people who noticed this person that wanted to dropout rushed to help the person, rushed to...encourage them” (Focus group, lines 838-842).

Community Service

The Non-Cognitive Questionnaire (NCQ) identified two aspects to community service: (a) identification with a sub-community on campus, and (b) ‘giving back’ (Tracey & Sedlacek, 1985, p. 409). The first aspect ‘community identity’ is seen as “having a community with which students of color and women can identify and from which they can receive support” (Sedlacek, 2004, p. 47). The second aspect, ‘giving back’ is seen as a commitment to give back; “involvement in his/her cultural community” (Sedlacek, 1991, p 78) through volunteer work and similar programs. For minority students this second aspect of community service is also related to the Leadership sub-scale.

Identification with Community: Possible scores on the *Community Service* scale range from a low score of 2 to a high score of 8. Vanguard Scholars scored an aggregate mean score of 6.65 (SD = 1.19) on this sub-category, with a T-score of 62.

In their responses to open-ended questions and in the focus groups, respondents made the distinction between the dual aspects of ‘Community Service’: Typical ‘community identity’, responses were those that addressed the respondent’s being a representative of communities back home, or of minority populations in general. Two such responses were: “The greatest impact of (the Vanguard program) has been on future generations in my family/community” (Response to survey question #111), and “the

Vanguard program has a lot to do with how much cultural diversity the university has, and...it's helped me...embrace my culture a lot more" (Focus group, lines 568-574).

Community Service: The second aspect of *Community Service*, 'giving back' was also addressed both within the survey and within the focus groups. Forty-three respondents (94%, SD = .55) agreed with the statement that 'It's important to try and give back to the community'; only two respondents reported 'Neutral' and there were no respondents who responded 'Disagree'. Through their community service, respondents: a) contributed to their own community of Vanguard Scholars and b) contributed to organizations outside of the university community. Within the university, scholars helped other Vanguard Scholars through peer support and tutoring: "I am able to help others who are having difficulties in the subject area" (Response to survey question #107).

Outside the community, scholars 'gave back' through community service to their communities of origin, or to their local Drexel community: "(Vanguard) students are willing to give back to the community because since we feel that this (program) is helping us achieve our goals and get an education that we should do community service or tutor other kids (so) that, we can give them a little hope." (Focus group, lines 140-145). And, "it was the (Vanguard program) that got me to think beyond just students and ...I got involved with *Habitat for Humanity* and giving back to the communities" (Focus group, lines 2435- 2439).

Respondents generally felt a strong commitment to both aspects of 'Community Service', (i.e., to their peer group and to community service), but peer identification was more important. A total of forty respondents (81%) responded affirmatively to the statement "being a part of the Drexel Vanguard program has been important to my

success.” Vanguard respondents expressed a strong group identity with other Vanguard Scholars: “I see myself in all of the people I know in (the Vanguard program) and so for me, for them to succeed is like for me to succeed” (Focus group, lines 432-434). And thirty-one respondents (71%) reported that many of their closest friends are or were Vanguard scholars.

Identification with the Vanguard cohort appears to be related in some way to the formation of self-concept that marries community of origin to academic achievement. Perhaps as a way of coming to terms with the enhanced life and career opportunities that come with the Vanguard scholarship and a college degree, Vanguard scholars appear to accept the responsibility to use their personal good fortune and academic success as a way of contributing to the betterment of their fellow Vanguard scholars and home communities.

The life-long bonds I have formed with other Vanguard scholars have carried me throughout my college career. And, when I wedged my way into difficult situations, my last bastion and the place I always turned when things had gone horribly awry was to the faculty that supported Vanguard. And as the scholars before me led me down my path, I have turned and reached a hand back down, helping to bring the rest of my Vanguard family along with me. I never let myself forget how indebted I am to this program, and I put its’ success and the success of its’ scholars above all else” (Response to survey question #111).

With this identification with the group came a personal inner strength and a positive self-concept that fed the desire to contribute back to a home community. In

stating three current goals one respondent wrote: “Use the education I obtained...to effectively lead and teach others. Teach aspiring engineers the fundamentals they need to succeed in industry and school. As well as encourage youths to pursue technical fields” (Response to survey question #86). Similarly, when asked why he had been chosen as a Vanguard Scholar, another respondent wrote: “I am able to help others who are having difficulties in the subject area. I am also able to work well in groups as well as work independently. I have high career goals, and after completion of my education, I would like to give back to the community” (Response to survey question # 107). Lastly, in writing of the impact of the Vanguard program his life and academic success, one respondent summed up the personal commitment of Vanguard Scholars to community service: “The greatest impact has been on future generations in my family/community. I have experienced a culture, academic, that many people in my community never even dream of. I can now lead by example and build upon a solid foundation rather than building from scratch” (Response to survey question #111).

Knowledge Acquired in a Field

The eighth and last non-cognitive ability, *Knowledge Acquired in a Field*, is defined as: “Unusual and/or culturally related ways of obtaining information and demonstrating knowledge” (Sedlacek, 1991, p. 76). In a more recent book, Sedlacek provides additional explanation: “Persons of color are more apt to learn and develop by way of methods that are less traditional and outside the education system. The methods may be related to culture or gender and the field itself may be nontraditional” (Sedlacek, 2004, p. 48).

Possible scores on the *Acquired Knowledge* scale range from a low score of 2 to a high score of 6. Vanguard respondents scored a mean score of 5.13 (SD = .96) in this sub-category, with a T-score of 70. This score is more than .5 higher than the highest score on this scale reported for any of the seven reference groups cited by Sedlacek (2004, p. 178).

In looking for possible explanations for this particularly high score, two alternatives are suggested: (a) students' learning through their co-operative education experiences, and (b) the added educational value of undergraduate research. Support for both potential explanations was found in the survey and in the focus groups:

Impact of Co-operative education (Co-op): Co-operative Education with its' focus on experiential learning is a key component of the undergraduate education program at Drexel University. All Vanguard scholars have completed one or more six-month co-op internships through which they learned valuable skills outside of the classroom. One respondent in commenting on things he was proud of having accomplished stated: (Being) "the first intern to obtain an employee excellence award at (the international engineering firm where the respondent did his co-op)" (Response to survey question #88).

Impact of Undergraduate Research: Twenty-five scholars (54%) reported that they had participated in undergraduate research experiences. "(It) reinforces everything you learned in co-op so that you don't forget the skills that you learn so you can understand what's going on around you and apply the stuff you're learning in a classroom to projects that could change the world" (Focus group, lines 387-391).

In response to a question about why he or she had succeeded where others had failed, one respondent offered an interesting comment about the salience of this factor: “I’m driven to prove that it takes more than a 4.0 to be successful in life. I believe that experience, hard work, social skills, etc. make the difference between a smart man and a wise one” (Response to survey question #108).

Relationship of Non-Cognitive Abilities to College Retention

When asked why they believed they had been chosen as Vanguard Scholars, thirty two of the thirty six respondents (88.8%) credited non-cognitive factors; only four cited academic achievement. Representative responses included: “They saw that I was a leader, and although I wasn’t always the smartest one of the group, I had the determination to finish what I had started”, “My drive and persistent nature”, “my academic success in high school along with my personality traits”, (Responses to survey question #107) were typical of the majority of the responses. One respondent recognized that NACME, in their assessment of potential Vanguard scholars, had used both academic achievement and non-cognitive abilities to select final candidates:

The Vanguard assessment takes into consideration the student as a person.... Anyone who has met me in the last three years can tell I’m intelligent, ambitious and determined. All these things that can’t be obtained by SAT, ACT, or whatever other numbers universities use. Vanguard may be searching for minorities in engineering, but with the assessment it is evident that what makes a Vanguard Scholar...(are) more intrinsic

qualities that are needed in people that will be looked to in the future as leaders” (Response to survey question #107).

Vanguard respondents also recognized that non-cognitive abilities had played a large role in their college success. In response to a question about why they had succeeded in college where other students had failed, *all* (100%) of Vanguard respondents articulated statements indicating that non-cognitive abilities had made the difference in helping them succeed. Although six of the eight non-cognitive abilities were mentioned, the factor mentioned most frequently in both the focus groups and in the open-ended responses was Positive Self-Concept, including ‘determination.’ Of forty responses to the question, thirty-one (78%) mentioned determination and a positive self-concept. Representative statements included: (a) “I am willing to keep trying after others have quit”, (b) “when things take a down turn or I encounter obstacles, I just keep pushing and fighting because I don’t like accepting defeat;” and (c) “I have the drive to succeed at all costs” (Responses to survey question #108).

Additional responses mentioned: (a) faith in God (2 responses/5%), (b) realistic self-assessment (1 response /2.5%): “I recognize when I fail and try to learn from it and go forward”, (c) the availability of support (2 responses /5%): “the strong support from my family and friends”, (d) leadership (1 response /2.5%): “I have remained active in many organizations, (e) commitment to community (1 response /2.5%): “Giving up is not an option because I am representing more than just myself”, and (f) acquired knowledge (1 response /2.5%): “my well-rounded background gives me (the) ability to synthesize ideas beyond the scope of my coursework.” (Responses to survey question #108). Two non-cognitive abilities, ability to negotiate a system and preference for long-term goals

were not volunteered by respondents in open-ended responses as contributing to college retention, but received high scores when prompted by direct questions.

Research Question Two: Summary of Results

As a group, Vanguard Scholars appear to possess high levels of the eight non-cognitive abilities shown in the research literature to be positively related to academic success and college retention. Vanguard scholars had above average levels of Positive Self-Concept, Leadership, Ability to Negotiate the System, and Knowledge Acquired in a Field, and average levels of Realistic Self-Appraisal, Preference for Long-Term Goals, Availability of a Strong Support Person and Commitment to Community. Further, in their personal statements, made in the survey and focus groups, scholars attributed their academic success and high retention to these factors. In particular, they mentioned determination (a component of Positive Self-Concept) as a key contributor to their success.

The data appear to support Padilla's 'Black Box' theory, whereby successful students are able to develop heuristic and conceptual knowledge that helps them overcome apparent barriers to academic success. Much of this heuristic knowledge appears to be transmitted from one Vanguard Scholar to another: "I have excelled to this level because I had someone to show me where the doors were and teach me how to open them. The lessons I have learned here will stay with me for the rest of my life and will never forget everyone that has helped me along the way" (Response to survey question #111).

Research Question Three: University-related Social and Environmental Factors

Social Environmental Factors

What do Drexel Vanguard Scholars perceive as the university-related social and environmental factors that contribute to the high graduation rates of students in the program? How much importance do students ascribe to such factors as scholarship support, campus environment, a cohort learning experience, shared residential living, participation in campus-related activities, faculty involvement, scholar advising, research opportunities, and academic support? How do these factors relate to increased academic persistence and graduation rates?

Scholarship Support

Impact of the scholarship on choice of university:

For the majority of respondents (36 respondents/92%) their selection as a Vanguard scholar made the difference between going to Drexel University and going somewhere else: “It wasn’t necessarily very important for me to have the scholarship to go to college, but it was definitely the reason for me coming to Drexel. Had I not had...the scholarship, I would have gone somewhere else.”(Focus group, lines 1437-1441). In fact, several respondents within the focus groups indicated that the university was not one of their top choices, and in fact, might not have been a school they were considering at all. “I never heard of Drexel until I got the NACME (Vanguard) scholarship, and then out of all of the schools on the NACME list, Drexel was the best one, so it’s the only reason why I went there” (Focus group, lines 82-85). Thus it would appear that generous scholarship programs that underwrite a large portion of college

costs, such as the Vanguard program, serve as effective recruiting tools for targeted populations.

Impact of scholarship support on retention:

However, 32 (70%) of these same respondents also felt that the scholarship alone was not sufficient to keep them at the university through graduation. Although retaining the scholarship was necessary in order for them to remain in college, respondents also reported that support services were critical to their retention. The following statement is representative of respondents' comments on this issue: "The combined (scholarship and support)...makes the difference in most of us. Just like they say in... the real world, 'money is not everything'. It's just the same thing with the scholarship. I'm pretty sure most of us got other offers and other scholarships for different universities, but we didn't feel the network...the support from other programs" (Focus group, lines 224-231). For the majority of respondents, the coupling of socio-emotional, academic and financial support was key to their academic success and college retention.

Campus Environment

Although, as was reported previously, Vanguard Scholars had mixed opinions about how welcoming the campus was in general to minority students, they generally viewed their participation in the Vanguard Program as a positive factor in helping them achieve academic and social integration. Thirty-one respondents (62%) agreed with the statement that the university was committed to a successful environment for Vanguard Scholars; twelve (24%) respondents were neutral, and six individuals (12%) voiced disagreement. Further, a majority of Vanguard respondents agreed with the series of survey statements about the various elements that make up the campus environment:

friends, presence of other minority students, availability of faculty, cohort housing, and the ready availability of emotional and educational support:

Table 15:

Campus Environment Quality Indicators

N= 45

<u>Statement:</u>	<u># in Agreement</u>	<u>%</u>	<u>SD</u>
Closest friends were Vanguard Scholars:	31	68%	1.19
There have been other minority students in most of my classes:	29	63%	1.32
I have gotten to know students with different racial backgrounds	34	97%	.62
I have at least one good friend of a different race:	43	95%	.21
I was able to meet and work with faculty:	27	59%	1.00
Living with Vanguard scholars helped me academically:	30	66%	.69
Living with Vanguard scholars helped me socially:	31	74%	.57
I was able to find someone on campus to help me:	40	70%	1.09
Some faculty care about the success of Vanguard Scholars	33	73%	1.04
I used academic support services to increase my academic skills	27	60%	.49

Responses to these closed-response survey questions support the conclusion that, as a group, Vanguard Scholars have been able to achieve both academic and social integration. In particular, the Vanguard program has helped participants to build friendships with individuals of different racial and ethnic backgrounds, has facilitated the development of relationships with faculty and university support services, and has contributed to participants' academic success. However, an analysis of the statements

made in the focus groups and of responses to open-ended questions within the survey, indicates that respondents made a distinction between their experiences within the Vanguard program and their experiences within the university as a whole. This lends support to the theory that the Vanguard program creates a supportive micro-environment on campus that shelters participants from the harshest effects of the university environment.

Vanguard respondents overwhelmingly reported that in their opinion, the program services delivered within the Drexel University community contributed importantly to their college and professional success. Representative focus group statements include: (a) “I know that without financial aid I wouldn’t have been here in the first place and without the student support I wouldn’t still be here” (Focus group, lines 1768-1770); and (b) “Both the financial and the student work portions of the program were just essential for (me); for others who were more academically prepared, I don’t know” (focus group 1776-1778). We shall now examine each of the program components to learn what Vanguard respondents believed each contributed to their academic success and college retention.

Cohort

In both the survey and focus groups Vanguard Scholars spoke eloquently about the impact of the program on their college success, and in particular about the value of the cohort. Forty respondents (81%, $s = 1.27$) agreed with the statement that ‘being a part of the Vanguard program has been important to my success.’ In open-ended responses, and in focus groups, respondents spoke about the ‘family’ that they had become: “It’s like you actually become the family that they want you to be” (Focus group, lines 371-

372).) “When you surround yourself with the type of people you want to be with, which are the Vanguard scholars, determined students who come from disadvantaged backgrounds, they know who you are and they’re just like you, it makes it easier for you to...succeed “(Focus group, lines 411-414).

Respondents stated that the seed of belonging to the Vanguard group was planted during the *Summer Immersion*, the initial introduction of Vanguard Scholars to each other and to the program that was held the summer before the beginning of freshman year. Introduced by NACME as an essential program component of the Vanguard program, the *Summer Immersion* was a three week academic ‘boot camp’ that introduced participants to other students from similar backgrounds with similar academic and career goals, provided a shared bonding experience that provided emotional strength for the cohort experience, and generally set the stage for friendships and support that would last throughout their college careers. One focus group participant reported a perspective that was reflective of the opinion of other respondents: “The bonding experience that you have with the other students at the Immersion is just something that I can’t fathom how I would have gotten through Drexel without it” (Focus group, lines 2544-2546).

When asked for suggestions to improve the Vanguard program, focus group participants mentioned ‘expanding the *Summer Immersion*’ as the single most requested program improvement. Fifteen focus group statements (5.2% of total focus group statements) referred to the importance of the Summer Immersion: “From my personal experience, what I thought helped me out the most.... (was) the *Summer Immersion*” (Focus group, lines 452-453). Respondents in both the survey and the focus groups repeated similar statements. Thirty-eight (84%) respondents felt that the *Summer*

Immersion significantly helped prepare them for the college experience. Thirty-six (80%) believed that the *Immersion* had helped with their social integration while thirty-four (75%) believed that the *Immersion* had helped with their academic integration into the university community.

Institutional Environment

According to the college retention theories of the Tinto, Bean and Padilla, the perception of a receptive institutional environment is critical to a individual student's academic and social integration. As was discussed in the presentation of non-cognitive abilities, Drexel Vanguard Scholars have demonstrated abilities to successfully negotiate the campus system, including dealing with an institutional climate that they view as sometimes racist. "Drexel has a really nice community where everyone is supporting each other and you can see the friendship and that's really strong...at the same time they're providing us with support" (Focus group, lines 232-237). The ready availability of academic and social support services, combined with the cohort experience helped to convey a welcoming and supportive environment to Vanguard Scholars and reinforced their perception of a receptive university community: "You gave this personal attention to each of the students who were here and that extra personal attention...was I think instrumental in keeping most of the students here and...it eased my passing through Drexel" (Focus group 1794-1800)

Housing

Following the bonding experience of the *Summer Immersion*, shared housing extended the opportunity to create community and to build a common identity of academic success. "You get to meet everybody (in *Summer Immersion*) and ...they

house you with the (other scholars). It's like building stronger bonds and reinforcing the relationship that you have and helping you...to get through (Focus group, lines 365-370). Thirty respondents (66%, $SD = .690$) agreed that living with other Vanguard scholars had been helpful to their academic success: "The freshmen had their own dorms and compared to the other freshman dorms we got a lot more done, we studied a lot more" (Focus group, lines 540-543). Thirty one respondents (68%, $SD = .57$) believed that living with Vanguard scholars had expanded their social contacts. "In my experience, a key component to the success of the program is the residential/social aspect" (Response to survey question # 110). Scholars who lived together frequently studied together and provided much needed academic and emotional support to each other: "You could see us every night studying at the little table, you know, doing homework and stuff like that, and basically building a community where academics was important" (Focus group, lines 546-549).

As individual Vanguard Scholars became more secure about themselves within the university environment, they allowed themselves to move away from shared housing and the security of the Vanguard group, and become more independent. One respondent described the trend in this way:

I think that the very beginning is the most crucial time...in anyone's schooling and that's when everyone was already together in a tight group, and as everyone became comfortable with themselves, with the environment, with classes and everything—That's when they started to go off. You can see the people who were the strongest...and motivated to do their own thing left first, and the people who still needed that

connection would still stay with the group until they found themselves and they would go off on their own” (Focus group, lines 1597-1608).

Participation in Campus-Related Activities

As a group, Vanguard scholars participated actively in campus-based activities; in particular in minority professional organizations. Thirty-eight respondents (84%, $SD = .37$) reported that they had joined at least one of the following organizations: National Society of Black Engineers (NSBE), the Society of Hispanic Professional Engineers (SHPE), the Society for the Advancement of NACME Scholars (SANS), Minorities in Medicine, or Drexel Minorities Advancing in Technology (DMAT). Seven respondents (15%) reported that they had not joined any of these organizations.

Connection to Faculty & Staff

Within the survey, forty respondents (88%, $SD = .69$) agreed with the statement ‘At least one person on campus cared about me and my success.’ Responses to pen-ended questions in the survey and in the focus groups supported this finding. Vanguard respondents named individual faculty and administrative staff that they had become close to and who had intervened with the ‘system’ on their behalf. The quality of these responses indicated that as a group Vanguard Scholars, have located key individuals whom they trust, and whose friendship and support they value. Representative statements were: (a) “(Vanguard) gives you...that sort of confidence in the faculty, in the school, in the staff to know that somebody, somewhere within the school, within the administration will help you no matter what your problem is, no matter how big or how small.” (Focus group, lines 380-384); (b) “If it weren’t for (name of advisor), I definitely would not be in school anymore, no matter what. That’s one hundred percent, no doubt”

(Focus group, lines 2260-2262); and (c) “to have a Vice Provost on your side, it builds up your self-esteem about NACME and about the help you’re going to be able to get”

(Focus group, lines 373-375).

These relationships with faculty and staff appear to be initially the result of meeting with program advisors or as a result of the experience of students in undergraduate research. As indicated by the previous quotation, the feeling of trust and the sense of security that is created when students view faculty and staff as advocates and ombudsmen is very powerful, and appears to contribute both to an increased academic self-concept, and to a belief that support is available when needed.

Holistic Advising

Twenty nine respondents (63%, $SD = 1.32$) agreed with the survey statement that having a separate scholarship advisor in addition to college-based academic advisor had been helpful. Respondents elaborated on this in the focus groups. In response to a question about how the university could improve its programs for minority students, respondents advocated a more holistic advising or intervention program, suggesting “someone sensitive to issues that minority students go through...check on their financial situation, (and) their social situation...just the way that you (check on their) academic situation...to see how they’re doing in classes, if there’s any help that they need, any problems that they see” (Focus group, lines 651-658).

In further discussion, the point was also made that this advising or intervention had to be proactive, because “Minority students...tend to have a ...bad...outlook on their education because so many people have not supported them in the past that they don’t feel like they’re going to get the support now so they don’t go actively looking for it.”

(Focus group, lines 660-665). To these respondents, the issue of credibility is an important one. Any support programs or advising protocols the university chooses to implement must be implemented fairly and consistently. In addition, the university must take particular care not to promise more than it can consistently deliver.

Mentoring

Respondents in both the survey and the focus group generally made the connection between mentoring other students and “giving back”—connecting their Vanguard experiences to a commitment to community service: “I have mentored in the program since I was a freshman, and I can tell you that its biggest success is in building a support structure. Having upperclassman and faculty connections, plus peers in the same situation as you is crucial to retention and success” (Response to survey item #110).

In his response to how the Vanguard program had impacted his life and career, one respondent wrote eloquently about the impact of faculty and peer mentoring: “The lifelong bonds I have formed with other Vanguard Scholars have carried me throughout my college career. And, when I wedged my way into difficult situations, my last bastion and the place I always turned when things had gone horribly awry was to the faculty that supported Vanguard. And as the scholars before me led me down my path, I have turned and reached a hand back down, helping to bring the rest of my Vanguard family along with me. I never let myself forget how indebted I am to this program, and I put its success and the success of its scholars above all else” (Response to survey question #110).

Impact of the Vanguard Program on Retention

As a result of the 'fit' Vanguard Scholars perceive between themselves and the university, they expected to be academically successful and to graduate from the university. Forty-one respondents (90%, $SD = .558$) stated that they were completely committed to the goal of graduating from college, and thirty-eight (84%, $SD = .951$) responded that it was important that they earn a degree from Drexel University.

The strong *Academic Self-Concept* scores of Vanguard Scholars noted under the discussion of non-cognitive abilities along with the findings of a strong identification with both an academic goal and the university may be related. One possible explanation to be explored in future research is that campus-based social and environmental factors can contribute developmentally to an increase in non-cognitive abilities and thus, contribute indirectly, but significantly to student academic success and college retention. The following statement is representative of the opinions of the majority of Vanguard respondents about the impact of the program on their academic success and college retention and serves as a fitting synopsis of the results of this study:

My initial immersion into Drexel University was very much softened due to the Summer Immersion. This I believe was the key to my early success at Drexel. And, as everyone knows, once an object begins motion, it wants to stay in motion. I graduated at the top of my class and have met some of the most amazing people because of the Vanguard Program. I will always have someone to call on. I know I still would have graduated from college without the Vanguard Program,

but I know that I would still be struggling socially and would definitely still be living in my hometown. I'm very glad the Vanguard Program has allowed me to break out of my shell. I am a much more confident person for it (Response to survey question #111).

Research Question Three: Summary of Results

As a group, Vanguard Scholars reported that their perception of the Drexel University campus environment as being both welcoming and supportive, strongly influenced their academic and social integration, and thus contributed to their academic success and college retention. As described in statements given in the focus groups, and in responses to both closed-ended and open-ended response questions, Vanguard Scholars reported that their social integration and connection to campus began with their introduction to each other, to faculty and staff, and to the campus community through the summer immersion experience.

The *Summer Immersion* provided a strong group bonding experience that served to initiate the scholars' transition from high school to college as described in the Tinto, Bean and Padilla models of college student retention. This transition from a supportive home environment of home to a supportive college environment was enhanced and strengthened by a shared cohort living situation that resulted in the creation of a micro-environment with a strong culture of minority student achievement.

As relationships among the scholars deepened and strengthened, they began to create a mutually supportive community extending across race and gender lines. This cohort community of scholars served to provide both tangible services to the group such as academic tutoring and career mentoring as well as heuristic knowledge that helped

scholars achieve academic integration and social integration, and successfully negotiate their way through the 'black box' of the university system.

Participation in campus activities (a) helped students extend relationships outside of the Vanguard group, (b) reinforced their sense of community and (c) provided opportunities for leadership and community service. The development of meaningful relationships with faculty and staff also served to deepen student's ties to the university and their positive self-concept.

As students became more secure within the environment, they were able to branch out and act more independently; at the same time, this feeling of personal security enabled them to ask and receive help in the way of tutoring and academic support. As cohorts of students successfully negotiated their way through the university academic and social environment and achieved academic success, they, in turn inspired and supported the progress of other scholars within the group.

Summary of Chapter Four

This chapter described the results of the study in three areas: (a) the background characteristics of Vanguard Scholars, (b) non-cognitive abilities, and (c) university-related social and environmental factors.

Background Characteristics

The academic success and enhanced college retention of Vanguard scholars could not be explained by the background characteristics of race, gender, socioeconomic status, parental education, or high school GPA and course pattern. As a group, Vanguard scholars come from under-represented minority backgrounds, are from low and middle-income families, and are in the first generation of their family to attend college. They

have adequate high school preparation for academic subjects (though not for the social reality of the university), and they have slightly below-average SAT scores. However, Vanguard Scholars distinguished themselves with an exceptionally high level of educational aspiration,

Non-Cognitive Abilities

Vanguard respondents scored average or above-average scores in all eight non-cognitive abilities as measured by the Non-Cognitive Questionnaire (NCQ). Vanguard respondents had average scores on four scales: *Ability to Negotiate the System*, *A Preference for Long-Term over Short Term Goals*, *Leadership* and *Availability of a Strong Support Person*. Vanguard respondents scored above average scores in: *Academic Self-Concept*, *Self-Appraisal*, *Commitment to Service*, and *Acquired Knowledge*. When asked to give an explanation for their high rate of college retention, all Vanguard respondents credit non-cognitive abilities, particularly determination, as being responsible for their success.

University-Related Social Environmental Factors

Buffered by their experience within the Vanguard program, respondents perceive the university environment as being both welcoming and supportive. Although a certain level (to be determined in future research) of scholarship support is considered essential to their ability to complete a college education, Vanguard Scholars as a group, reported that what kept them at the university was the array of support services available to them.

This sense of belonging and group support began in the Summer Immersion, and was strengthened through layers of experiences with fellow Vanguard scholars in the cohort through a) shared residential living, b) relationships with faculty and staff, c)

participation in campus-based organizations, and d) holistic advising. These experiences taken as a whole, positively influenced their academic and social integration, and contributed to their academic success and college retention.

Chapter Five will include an interpretation of these findings, a discussion of the most salient issues for the retention of under-represented minority students in engineering and technology-related disciplines, and present recommendations for future research and practice.

CHAPTER FIVE: CONCLUSIONS AND FUTURE RESEARCH

Chapter Outline

This chapter presents an interpretation of the data that were described in Chapter Four and a discussion of the programmatic and research implications of these findings. The present researcher attempts to explain the results of the study in terms of the three theories of student retention described in Chapter Two: (a) Tinto's *Model of Student Integration*, (b) Bean's *Student Attrition Model*, and (c) Padilla's *Black Box Theory*.

This chapter consists of four major sections: The first section presents the conclusions of the study. The second section addresses the limitations of the study. The third section discusses the implications of the study and the fourth section provides suggestions for future research.

Conclusions

Study findings indicate that, if institutions of higher education are to successfully recruit and retain under-represented minority students in engineering and technology-related disciplines, changes should be made in college admission processes. Changes should also be made in both the kind and level of campus support programs that are provided to students once they arrive on campus.

1. The results provide strong support for an admissions process that, in addition to such criteria as high school GPA and high school courses taken, includes the assessment of non-cognitive abilities relevant to academic success and increased college retention.
2. Study results provide support for an integrated theory of student retention that includes the findings a) non-cognitive abilities play a large role in student

retention, and b) participation in a cohort group provides members with heuristic knowledge critical to the successful negotiation of the 'Black box' of a university campus.

3. Findings further suggest that the relevant non-cognitive abilities are not static, but can be increased (or decreased), as a result of an individual's interaction with his or her environment. This supports Gonzalez's findings that students were able to acquire attitudinal characteristics necessary for college success as a result of positive interaction with the college environment.
4. Although all of the non-cognitive abilities studied appear to exert some influence on an individual's ability to gain academic and social integration within the university environment, the creation of a 'positive self-concept' appears to be most salient.
5. Although various facets or components of the university campus environment were studied separately and disaggregated within the study, students experience the campus holistically, and formulate judgments about their 'fit' within a particular environment on the totality of their experiences.
6. Vanguard respondents reported that the community of Vanguard Scholars was their primary source of friendship and heuristic knowledge. The community provided individualized academic skill development and emotional support and as well valuable guidance that helped its members successfully negotiate a path toward increased integration within the broader university community.
7. Supportive relationships with faculty and staff created established through advising, work-study employment or experiences in undergraduate research

appear to have reinforced scholars' identification with the university and provided both academic and social benefit. A strong identification with the university through its faculty and staff helped to support academic integration and to reinforce the formation of a strong academic self-concept. At the same time, faculty and staff provided both academic support and important heuristic knowledge that were needed in order to successfully negotiate the university's academic and social environments. As students became more trusting of university faculty and staff and more secure within the university environment, they were better able to take advantage of academic support services such as tutoring when needed.

8. This ability to accept help in the form of academic support services enhanced scholars' academic achievement and academic self-concept. Employment or volunteer opportunities, policy interpretation, advocacy with the Office of Financial Aid, as well as career guidance and information about program eligibility were all mentioned by respondents as being benefits resulting from trusting relationships with faculty and staff.
9. Lastly, scholars' experiences within campus-related groups, primarily in ethnically-related professional groups and inter-mural sports programs helped participants to both develop and to demonstrate leadership abilities and enhanced social integration. As students became more proficient in leadership skills, and successfully achieved academic and social integration on campus, they began to look outward from the campus community to serve the greater community through volunteer service.

Limitations of the Study

The present study was an exploratory one, and thus is limited in terms of the generalizations that can be made to other populations. Through this study several questions leading to further research have been generated along with recommendations for improved practice.

Because the study population was limited to under-represented minority students admitted as Vanguard Scholars to Drexel University, a limitation and a future area for research is the extent to which the findings of this study apply to other under-represented minority populations at Drexel University, both undergraduate and graduate.

Because the respondents selected themselves for participation in both the Internet study and the focus groups, the opinions of individuals who had left the university either to transfer to other institutions or to interrupt their college studies were not reflected in the results.

This researcher believes that the opinions of the students who left the program would have been more negative about the program in general, and that these individuals would have had lower scores in the eight non-cognitive abilities measured by the NCQ. Because participation in both parts of the study was anonymous, the researcher did not know the identity of any of the participants and therefore, had no ability to follow up personally with individuals who did not respond in order to gather these presumably more negative responses. A future study should examine the responses of individuals who have left the university prior to graduation.

In the survey and particularly in the focus groups, respondents voiced opinions that were extremely complimentary of the Vanguard program. Although a positive

response to the program is understandable given that the scholarship made college attendance possible for many of the respondents, it is believed that the anonymity of the study, and in particular having a focus group facilitator that was not known to the respondents, contributed to the respondents voicing more positive responses than would have been the case had the focus group facilitator been a recognized member of the university community.

Because the stated purpose of the study was to understand the impact of the Vanguard program on academic success and career plans, respondents may have assumed that the future of the program was in jeopardy and that an overly positive response would help to assure continuation of the program. Further research should be done with Drexel Vanguard Scholars using a known facilitator drawn from the university community to elicit specific recommendations for program improvement.

The findings of the present research study offer several suggestions on ways to increase the effectiveness of recruitment and retention strategies for underrepresented students in STEM majors. Although several interesting findings were generated in this study, care should be taken not to over generalize the results. Both because of the small number of respondents, and because the study was done at a single university, the non-cognitive and institutional factors that were perceived as contributing to college success might not be similar to those deemed important at other institutions.

Lastly, because the present research study was conducted at a single site, using campus cultural context as an intervening variable, it is recommended that the study be replicated with NACME Vanguard Scholars attending other universities, and on other campus-based retention programs to see if the study findings apply to other campuses.

Implications for Practice

The research findings suggest that the successful retention of under-represented minority students in engineering and technology-related disciplines is the result of two separate but related processes: (a) admitting students who, in addition to the requisite academic background and cognitive abilities, possess non-cognitive skills associated with successful college achievement, and (b) creating a welcoming campus environment with holistic support services that affirmatively support academic and social integration of the participants. This would appear to have implications for future practice as well as for future research.

Admissions

With regard to admissions, the results of the study support the findings of William Sedlacek that for African American and Hispanic college students, key non-cognitive variables can help to compensate for the lack of pre-college characteristics traditionally associate with college success. When some, as yet to be determined, level of financial need has been met, students who are a) able to formulate a personal identity that includes 'scholar', b) who are able to work to achieve long-term versus short-term goals, c) who are able to accurately assess their progress towards these goals and make needed corrections, d) who have a strong support system available to them, e) who are given opportunities to show leadership, f) who are able to learn from experiences both in and outside the classroom g) who are able to successfully negotiate formal and informal systems within the university and h) who view themselves as part of a larger cultural community that they both represent and want to serve, dramatically increase the

likelihood that they will achieve academic success in college and will be retained to graduation.

For these reasons the NCQ appears to be an effective tool for surfacing potentially successful students where normal admissions criteria such as high school grades, course pattern and standardized test scores are either conflicting or confusing. The NCQ could also be incorporated as part of regular college admissions protocol and NCQ scores could be used to inform applications decisions. As an alternative, college application essays and recommendation letters could be read with an eye toward identifying key non-cognitive abilities such as positive self-concept, leadership, and commitment to community.

In examining the non-cognitive factors shared by Vanguard Scholars who had been successfully retained in college, we found several characteristics that would appear to be relevant to academic and social success for all students. In particular, the formation of a self-identity that includes scholarship, the ability to realistically assess one's performance, and the ability to be resilient would appear to apply to majority as well as to minority students. Care should be given to incorporate admissions assessment criteria that would allow the university to select students who upon application to college possess high levels of the non-cognitive abilities that are most predictive of academic success and retention in college.

Campus Retention Programs

Study findings also suggest that once under-represented minority students are admitted to the university, their successful retention depends in large part, not only on the array of academic and social support services that are available to them, but on the way

under-represented minority students are initiated into the campus community and viewed by faculty, administrators and other students on campus. The NACME Vanguard program, appears to have been successful on the Drexel University campus precisely because it addresses both the recruitment and retention directives. The study findings would appear to indicate that future campus-based retention programs should incorporate: (a) significant levels of financial support, (b) a cohort model that allows the creation of a strong peer support network, (c) academic support programs designed to increase excellence, not as remediation, (d) holistic advising that intentionally promotes the development of non-cognitive abilities, and (e) opportunities for rich interaction with faculty and staff preferably with opportunities for undergraduate research, and career internships closely related to a student's undergraduate major.

Suggestions for Future Research

As an exploratory study, the findings of this study can only suggest areas to be further developed through future research. Some of these would include:

1. Replication of the study with non-Vanguard minority students attending Drexel University, to determine normative values of non-cognitive variables for successful minority students. Although it is the belief of the researcher that the findings of this study will prove to be valid for other underrepresented minority students at Drexel University, this needs further exploration.
2. A longitudinal study of under-represented students from admission through graduation, to be able to chart the growth in non-cognitive abilities as students' progress through a university system. Such a longitudinal study would allow for the comparison between successful students and students who

leave the university prior to graduation. This would allow us to better understand the non-cognitive variables that are most salient to student academic achievement, and integration within the specific university environment.

3. Replication of the study with groups of NACME Vanguard scholars at other universities. The cultural context in which the Vanguard program operates at the focus university is unique, and while elements of the Vanguard program are common across all university platforms, each university provides a different social environment to be negotiated by its' students. It is hoped that replication of the study in one or more of the eight other participating NACME Vanguard universities would highlight the university-related social environmental factors that are a) common to all university environments and b) most powerful in promoting academic success and college retention.
4. Replication of the study with other well-defined groups of students, minority and majority to chart the development of normative patterns of non-cognitive variables deemed critical for academic retention.

Unless we as a society can find ways to fully develop and utilize, on behalf of the common good, the talent and potential of all of our people, we will be relegated to the rank of a once-great nation that failed to exert leadership at a moment of great cultural change. I believe that we are currently at such a crossroads. If we as a nation invest financially and emotionally in the development of skills, talent, and potential of eager and determined African-American, Hispanic and American Indian youth, I believe that we will once again travel the path of moral leadership that is needed in the twenty-first century. It is my hope that this research study has contributed in some meaningful way to an understanding of the kinds of admission and retention practices that will benefit both under-represented minority students and the academic institutions that seek to educate them.

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APPENDIX A: Invitation to Participate in the Study



Office of the Provost

January 15, 2004

Name:

Address 1:

Address 2:

Dear _____:

You are invited to participate in a study about the Vanguard Program as it operates at Drexel University and the effect it has had on your college life and career. This study is being conducted under the direction and with the approval of the School of Education under the advisement of Dr. Frank Harvey, Ed. D. Dr. John B. Slaughter, Ph.D., president of NACME has also given his approval for the study.

As you may know, many colleges and universities have experienced a drop in the retention of African American, Latino and American Indian students over the past several years. Information gained from this research may provide administrative leaders at Drexel University and other universities with a knowledge base that will assist us in introducing or improving programs that will help African American, Hispanic and American Indian students attain a college education.

Your participation in this study is completely voluntary and will be anonymous. Your responses will be confidential and will not be able to be traced or identified by the researcher. Your response is very important to the success of this research project. As a participant, only you can provide an accurate and comprehensive view of your experiences within the Vanguard program as it operates at Drexel University.

There are two opportunities for participation in the study—through an Internet-based questionnaire, and in a focus group. Within the next several weeks, we will send directions for accessing the questionnaire via the Internet to the e-mail address you provide us in response to this letter. You will be able to access the questionnaire using a secure password that you create and that only you know. Your responses will be sent to a secure server located outside of the university, and you will never be able to be identified.

The questionnaire is designed to solicit your responses within three defined areas of interest: the effectiveness of the Vanguard Program in addressing minority student retention, programs and services that could be offered to increase minority student retention, and personality and demographic characteristics that may be important in understanding college retention. Completing the questionnaire should require no more than 15-20 minutes of your time.

Please return the attached form in the postage-paid envelope along with a valid current e-mail address to:

XXXXXXXXXX

XXXXXXXXXX
Drexel University
Philadelphia, PA 19104

In a few weeks you will be invited to participate in a focus interview group to discuss particular aspects of the Vanguard program, and issues that were raised in response to the Internet survey. Again, your participation will be completely anonymous.

All focus group participants will be given an *Amazon.com* gift certificate as a thank you for their time, and will be provided with a meal. Again, your participation in the focus group is completely voluntary and will be anonymous; All focus group interviews will be conducted by an independent researcher with no involvement in the Vanguard program. During the focus group, you will not be identified by name, but with a letter. At the conclusion of the study, all individuals who provide a valid mailing and e-mail address will be provided with a copy of the findings.

If you have any questions regarding the study, or would like more information, please contact the Office of Institutional Research at 215-895,----.

Sincerely,

Vice Provost

Enclosures:



Drexel University Vanguard Program Study

Name: _____

Drexel ID #: (If known): _____

Current Mailing Address:

Valid E-mail address: _____

Please return to:

Drexel University
Philadelphia, PA 19104

APPENDIX B: Instructions for Accessing the Internet Survey

January, 2004

Drexel University has agreed to participate in a research study that is being conducted as part of a doctoral dissertation. As a current or former Vanguard Scholar, you are being invited to participate in this research study.

The purpose of this study is to learn what factors contribute to the success of students in the Vanguard Program. Information gained from this research may provide administrative leaders at Drexel University and other universities with a knowledge base that will assist us in introducing or improving programs that will help African American, Hispanic and American Indian students attain a college education.

Your participation in this survey will require approximately 30 minutes of your time. The survey consists of survey and short answer questions that are to be completed online. You will be able to complete the survey and questions at your convenience, 24 hours a day, from Sunday, February 1, 2004 until Monday, February 16, 2004, from any computer that has online access.

The survey resides on a secured server that is configured to assure complete confidentiality. At no time will you be asked to identify yourself. As responses are submitted, all electronic identifying data is stripped from the survey, and the data is automatically compiled in a common database. The data will be reported in aggregate form only, and the reported data will not include any information that would make it possible to identify individual responses.

Your decision to participate is strictly voluntary, and in no way affects your relationship to Drexel University or to anyone associated with the Vanguard Program. You may also choose to discontinue your participation at any time.

If you choose to participate, please access the following site:

<http://www.agilesolutions.org>

The first time you go to the site you will be asked to register to take a survey. You will register using a USERID that only you know and a password. Once this is completed you will be prompted to go to the survey. From the list of available surveys, please select _____. The code is ----.

Once you have logged in, you will be taken to the survey.

This site has a save feature which will allow you to save the uncompleted survey and/or questions and return to the site at your leisure. When returning go to the original address:

<http://www.agilesolutions.org>

On return visits, you must enter the USERID and password that you used to create your account to reenter the site.

Thank you for your time, and I hope that you will consider participating in this study.

Drexel University

APPENDIX C: Survey Instrument

Survey Questions:

1. Being a part of the Drexel Vanguard Program has been important to my success

- ☐ Strongly Disagree
- ☐ Neutral
- ☐ Strongly Agree

2. I believe that Drexel University is/was committed to creating a successful environment for Vanguard Scholars

- ☐ Strongly Disagree
- ☐ Neutral
- ☐ Strongly Agree

3. The University is/was unbiased in the treatment of minority students

- ☐ Strongly Disagree
- ☐ Neutral
- ☐ Strongly Agree

4. The University is/was more supportive of Vanguard Scholars than other minority students

- ☐ Strongly Disagree
- ☐ Neutral
- ☐ Strongly Agree

5. Minority perspectives are/were valued at Drexel University

- ☐ Strongly Disagree
- ☐ Neutral
- ☐ Strongly Agree

6. Drexel University is committed to the graduation of Vanguard Scholars

- ☐ Strongly Disagree
- ☐ Neutral
- ☐ Strongly Agree

7. If I had not been selected as a Vanguard Scholar, I would have attended college anyway

- ☐ Yes
- ☐ No
- ☐ Not Applicable

8. The Vanguard Scholarship made the difference between going to Drexel and going somewhere else.

- ☐ Yes
- ☐ No
- ☐ Not Applicable

9. All I needed to be successful in college was the scholarship; nothing else was necessary.

- ☐ Strongly Disagree
- ☐ Neutral
- ☐ Strongly Agree

10. Being part of a group of Vanguard Scholars has been important to my college success.

- ☐ Strongly Disagree
- ☐ Neutral
- ☐ Strongly Agree

11. Many of my closest college friends are/were Vanguard Scholars.

- ☐ Strongly Disagree
- ☐ Neutral
- ☐ Strongly Agree

12. Knowing other students that are going through the same things I am is/was helpful to me.

- ☐ Strongly Disagree
- ☐ Neutral
- ☐ Strongly Agree

13. I have been/was always able to find someone on the Drexel campus to help me with my problems.

- ☐ Strongly Disagree
- ☐ Neutral
- ☐ Strongly Agree

14. In college, I have gotten to know students with racial/ethnic backgrounds different from my own.

- ☐ Strongly Disagree
- ☐ Neutral
- ☐ Strongly Agree

15. There have been/were other minority students in most of my university classes.

- ☐ Strongly Disagree
- ☐
- ☐ Neutral
- ☐
- ☐ Strongly Agree

16. I have at least one good friend who is of a different race than I am.

- ☐ Yes
- ☐ No
- ☐ Not Applicable

17. Living with other Vanguard Scholars has been/was helpful to my academic success.

- ☐ Yes
- ☐ No
- ☐ Not Applicable

18. Living with other Vanguard Scholars has/helped me increase my social contacts.

- ☐ Yes
- ☐ No
- ☐ Not Applicable

19. As a Vanguard Scholar, I am/was able to meet and work with faculty.

- ☐ Strongly Disagree
- ☐
- ☐ Neutral
- ☐
- ☐ Strongly Agree

20. I believe that some Drexel faculty care about the success of Vanguard scholars.

- ☐ Strongly Disagree
- ☐
- ☐ Neutral
- ☐
- ☐ Strongly Agree

21. I can honestly say that at least one person on the Drexel campus cares/cared about me and my success.

- ☐ Strongly Disagree
- ☐
- ☐ Neutral
- ☐
- ☐ Strongly Agree

22. I have had the opportunity to do research as an undergraduate student.

- ☐ Strongly Disagree
- ☐
- ☐ Neutral
- ☐
- ☐ Strongly Agree

23. The Vanguard program has helped me to develop my leadership abilities.

- ☐ Strongly Disagree
- ☐
- ☐ Neutral
- ☐
- ☐ Strongly Agree

24. Having a Vanguard program advisor separate from my academic advisor has helped me stay on track.

- ☐ Strongly Disagree
- ☐
- ☐ Neutral
- ☐
- ☐ Strongly Agree

25. While in college I have joined/joined at least one of: NSBE, SHPE, SANS, Minorities in Medicine, DMAT.

- ☐ Yes
- ☐ No
- ☐ Not Applicable

26. University administrators know me/knew me and care(d) about my success.

- ☐ Strongly Disagree
- ☐
- ☐ Neutral
- ☐
- ☐ Strongly Agree

27. I have found individuals at college who have served as mentors and role models.

- ☐ Strongly Disagree
- ☐
- ☐ Neutral
- ☐
- ☐ Strongly Agree

28. While in college I used/am using SUCCESS/Center for Academic Excellence and/or Student Support Services to increase my academic skills.

- ☐ Yes
- ☐ No
- ☐ Not Applicable

29. The Vanguard Summer Immersion really helped me to prepare academically.

- ☐ Yes
- ☐ No
- ☐ Not Applicable

30. The Vanguard Summer Immersion was a big help in getting me prepared for the college experience.

- ☐ Yes
- ☐ No
- ☐ Not Applicable

31. I have actively participated in NSBE, SHPE or SANS activities.

- ☐ Strongly Disagree
- ☐ Neutral
- ☐ Strongly Agree

32. The Summer Immersion helped to connect me to the university and to other students.

- ☐ Yes
- ☐ No
- ☐ Not Applicable

33. I think that my SAT scores were a good predictor of my college success.

- ☐ Yes
- ☐ No

34. Through the Vanguard Program I have found mentors and role models that inspire me.

- ☐ Yes
- ☐ No
- ☐ Not Applicable

35. The Vanguard program has provided me with opportunities to give back to the community.

- ☐ Strongly Disagree
- ☐ Neutral
- ☐ Strongly Agree

36. I am/was satisfied with the quality of the relationships I have/had with people at Drexel.

- ☐ Strongly Disagree
- ☐ Neutral
- ☐ Strongly Agree

37. I don't know/didn't know enough people at college that I could let know the "real" me.

- ☐ Yes
- ☐ No

38. My family has given/gave me lots of encouragement to do well in college.

- ☐ Strongly Disagree
- ☐ Neutral
- ☐ Strongly Agree

39. I have doubts about whether I will finish my college education at this school.

- ☐ Yes
- ☐ No
- ☐ Not Applicable

40. I am absolutely positive that I will graduate from this university.

- A. Yes. I have already graduated
- B. Yes.
- C. I will probably graduate from this university, but I'm not sure.
- D. I will probably NOT graduate from this university, but I don't know.
- E. No. I have permanently left the university.

41. I have career expectations that require that I complete my college education.

- ___ Strongly Disagree
- ___
- ___ Neutral
- ___
- ___ Strongly Agree

42. I took the right math and science classes in high school to prepare me to do well in college.

- ___ Strongly Disagree
- ___
- ___ Neutral
- ___
- ___ Strongly Agree

43. I think that my high school prepared me well for college.

- ___ Strongly Disagree
- ___
- ___ Neutral
- ___
- ___ Strongly Agree

44. Going to college is sort of expected in my family.

- ___ Strongly Disagree
- ___
- ___ Neutral
- ___
- ___ Strongly Agree

45. My parents have had/had to sacrifice for me to achieve my dreams.

- ___ Strongly Disagree
- ___
- ___ Neutral
- ___
- ___ Strongly Agree

46. I am completely committed to the goal of graduating from college.

- ___ Strongly Disagree
- ___
- ___ Neutral
- ___
- ___ Strongly Agree

47. It is important to me that I earn a degree from Drexel University.

- ☐ Strongly Disagree
☐
☐ Neutral
☐
☐ Strongly Agree

48. If I need to earn money, I take/took time off from my studies.

- ☐ Yes
☐ No
☐ I Don't Know

49. My faith helps me overcome the obstacles standing between me and my goals.

- ☐ Strongly Disagree
☐
☐ Neutral
☐
☐ Strongly Agree

50. I work harder than other people to get what I want in life.

- ☐ Strongly Disagree
☐
☐ Neutral
☐
☐ Strongly Agree

51. When I put my mind to something, nothing can stop me.

- ☐ Strongly Disagree
☐
☐ Neutral
☐
☐ Strongly Agree

52. My family's support is essential to my success.

- ☐ Strongly Disagree
☐
☐ Neutral
☐
☐ Strongly Agree

53. I've already achieved more than most; nobody will blame me if I don't finish my college degree.

- A. I have graduated from college.
- B. Strongly agree
- C. Somewhat agree
- D. Neutral
- E. Somewhat disagree
- F. Strongly disagree

54. I think that it's important to try and give back to the community.

- ☐ Strongly Disagree
☐
☐ Neutral
☐
☐ Strongly Agree

55. When I encounter obstacles, I use my problem-solving skills to overcome them.

- ___ Strongly Disagree

 ___ Neutral

 ___ Strongly Agree

56. I entered Drexel in (Year):

- A. 1996
 B. 1997
 C. 1998
 D. 1999
 E. 2000
 F. 2001
 G. 2002
 H. 2003

57. I am (gender):

- A. Male
 B. Female

58. What race/ethnicity do you most identify yourself as?

- A. African American
 B. Hispanic
 C. Asian
 D. Caucasian/non Hispanic
 E. Native American/Alaskan/Pacific Islander
 F. I am of a mixed racial/ethnic background that includes African American.
 G. I am of a mixed racial/ethnic background that does NOT include African American
 H. No Answer

59. If you checked Hispanic or Multi-Racial in question #58, please identify your ethnic background (eg. Mexican, Puerto Rican, Asian/African American etc.) Otherwise, please put N/A.

60. I was born in the United States.

- ___ Yes
 ___ No

61. My mother's educational background is/was:

- A. Less than 8th grade education
 B. Some high School but less than h.s. diploma
 C. High School graduate
 D. Some college
 E. college graduate (B.S./B.A.)
 F. Graduate School/Professional School (Eg. M.S., M.D., J.D.)
 G. Unknown/No Answer

62. My father's educational background is/was:

- A. Less than 8th grade education
- B. Some high School but less than h.s. diploma
- C. High School graduate
- D. Some college
- E. college graduate (B.S./B.A.)
- F. Graduate School/Professional School (Eg. M.S., M.D., J.D.)
- G. Unknown/No Answer

63. When I entered the university, our family income was:

- A. Low income
- B. Middle Income
- C. High Income
- D. Unknown/No answer

64. My college major is/was:

65. My current academic status is:

- A. I am currently attending college in pursuit of an undergraduate degree.
- B. I am not currently attending, but intend to return to college.
- C. I am currently attending college in pursuit of a graduate/professional degree.
- D. I have graduated from college and am not currently enrolled in graduate/professional education.
- E. I have left college and do not plan to return in the foreseeable future.
- F. No Answer

66. My most recent college GPA (or GPA at Graduation) was:

- A. 3.5 or above
- B. 2.8-3.4
- C. 2.1-2.7
- D. 2.0 or below

67. While I was in high school I took honors/advanced placement courses

- ☐ Yes
☐ No

68. To my best recollection, my Math SAT score was:

69. To my best recollection my High School GPA at graduation was:

70. To my best recollection my Verbal SAT score was:

71. To my best recollection my TOTAL SAT score was:

72. While in high school I took the following NUMBER of math courses:

- A. One
- B. Two
- C. Three
- D. Four
- E. More than four

73. At the present time, I have earned the following number of college credits (from every college/university attended)

- A. I have graduated from college
- B. I have earned fewer than 50 credits
- C. I have earned between 51 and 100 credits.
- D. I have earned between 101 and 150 credits.
- E. I have earned more than 150 credits.

74. My student status at Drexel is:

- A. I transferred TO Drexel from another institution
- B. I transferred FROM Drexel to another institution
- C. My entire college education has been at Drexel University

75. I am in the first generation of my family to graduate from college.

- ☐ Yes
- ☐ No

76. I think that my family is richer, poorer, average, than most.

- A. richer
- B. poorer
- C. average

77. While I attended college I usually had a part-time job.

- ☐ Yes
- ☐ No
- ☐ Not Applicable

78. If you answered yes, to usually having a part-time job, on average how many hours per week do/did you work?

- A. Fewer than 10 hours per week
- B. Between 10 and 20 hours per week.
- C. Between 20 and 30 hours per week.
- D. More than 30 hours per week.

79. While at Drexel University I have had the opportunity to get to know minority faculty and staff.

- ☐ Strongly Disagree
- ☐
- ☐ Neutral
- ☐
- ☐ Strongly Agree

80. Being a Vanguard Scholar has helped me to figure out the "rules" that govern life at Drexel University.

- ☐ Strongly Disagree
☐
☐ Neutral
☐
☐ Strongly Agree

81. Even though I have chosen a different path from theirs, my friends continue to support me and my goals.

- ☐ Yes
☐ No
☐ Not Applicable

82. I have found some faculty and staff at Drexel University to be warm and caring.

- ☐ Strongly Disagree
☐
☐ Neutral
☐
☐ Strongly Agree

83. I have often felt alone and isolated on the Drexel campus.

- ☐ Strongly Disagree
☐
☐ Neutral
☐
☐ Strongly Agree

84. The Vanguard Program has helped me find a family away from home.

- ☐ Strongly Disagree
☐
☐ Neutral
☐
☐ Strongly Agree

85. How much education do you expect to get in your lifetime?

86. Please list three goals that you have for yourself right now:

87. About 50% of university students typically leave college before receiving a degree. If this has, or should, happen to you, what would be the most likely cause?

- A. I have already, or am absolutely certain that I will obtain a degree.
- B. To get a good job
- C. To enter military service
- D. It would cost more than I could afford.
- E. Marriage or family support.
- F. Disinterest in study
- G. Lack of academic ability
- H. Insufficient reading or study.
- I. No answer

88. Please list three things that you are proud of having accomplished:

89. The University should use its influence to improve social conditions in the community.

- ☐ Strongly Disagree
☐
☐ Neutral
☐
☐ Strongly Agree

90. It should not be very hard to earn a B average in college.

- ☐ Strongly Disagree
☐
☐ Neutral
☐
☐ Strongly Agree

91. I get easily discouraged when I try to do something and it doesn't work.

- ☐ Strongly Disagree
☐
☐ Neutral
☐
☐ Strongly Agree

92. I am sometimes looked up to by others.

- ☐ Strongly Disagree
☐
☐ Neutral
☐
☐ Strongly Agree

93. If I run into problems concerning school, I have someone who would listen to me and help me.

- ☐ Strongly Disagree
☐
☐ Neutral
☐
☐ Strongly Agree

94. There is no use in doing things for other people, you only get short-changed in the long run.

- ☐ Strongly Disagree
☐
☐ Neutral
☐
☐ Strongly Agree

95. In groups where I am comfortable, I am often looked to as leader.

- ☐ Strongly Disagree
☐
☐ Neutral
☐
☐ Strongly Agree

96. I expected to have/am having a harder time than most students in college.

- ☐ Strongly Disagree
- ☐ Neutral
- ☐ Strongly Agree

97. Once I start something, I finish it.

- ☐ Strongly Disagree
- ☐ Neutral
- ☐ Strongly Agree

98. When I believe strongly in something, I act on it.

- ☐ Strongly Disagree
- ☐ Neutral
- ☐ Strongly Agree

99. I am as skilled academically as the average college student.

- ☐ Strongly Disagree
- ☐ Neutral
- ☐ Strongly Agree

100. I expect to/have encountered racism at the university.

- ☐ Strongly Disagree
- ☐ Neutral
- ☐ Strongly Agree

101. People can pretty easily change my opinion even though I thought my mind was already made up on the subject.

- ☐ Strongly Disagree
- ☐ Neutral
- ☐ Strongly Agree

102. My friends and relatives didn't think I needed to go to college.

- ☐ Strongly Disagree
- ☐ Neutral
- ☐ Strongly Agree

103. My family always wanted me to attend college.

- ___ Strongly Disagree

 ___ Neutral

 ___ Strongly Agree

104. When course tutoring has been made available at no cost, I have attended regularly.

- ___ Strongly Disagree

 ___ Neutral

 ___ Strongly Agree

105. I wanted a chance to prove myself academically.

- ___ Strongly Disagree

 ___ Neutral

 ___ Strongly Agree

106. My college grades did not/do not really reflect what I can do.

- ___ Strongly Disagree

 ___ Neutral

 ___ Strongly Agree

107. I believe that I was chosen as a Vanguard Scholar because:

108. I think that I have succeeded where others have failed because:

109. Please list offices held and/or groups belonged to in college or in the community:

110. Is there anything further that you would like to share about your participation in the Drexel Vanguard Program that we have not asked?

111. Lastly, can you sum up how your selection as a Vanguard Scholar and your participation in the program has impacted your college success and your life so far?

APPENDIX D: Invitation to Participate in a Focus Group

February 15, 2004

Dear Vanguard Scholar:

Once again, we are writing you to offer you an opportunity to participate in a study about the Drexel University Vanguard Program and the effect it has had on your college life and career.

Last month, you were asked to return a form indicating your permanent mailing address, and invited you to participate in an on-line survey. We are extremely grateful to each of you who completed the on-line survey. If you have not yet completed the survey, we ask that you do it now. It is extremely important that as many Vanguard Scholars as possible participate in the on-line survey. Please log on to:

WWW.agilesolutions.org using an e-mail address and a password. Select the Vanguard Survey; the code is 2004

Now, we are inviting you to participate in a group interview—called a focus group. We have scheduled two focus groups:

- **Tuesday, March 9, 2004 at 6:00 p.m.—dinner provided**
Drexel University
Room 2019-2020 MacAlister Hall
3201 Chestnut Street
Philadelphia, PA 19104
- **Saturday, March 13, 2004 at 11:30a.m.—lunch provided**
YES College Preparatory School
353 Crenshaw
Houston, TX 77034

There are directions to both sites included with this letter.

Although you may know some of the other participants in the focus group, neither they, nor you will be identified by name during your discussion. An independent researcher not connected with Drexel University or the Vanguard Program will lead the discussion so you can be free to voice your honest opinions about the program. Your participation in this study is completely voluntary and will be completely anonymous. Your responses will be confidential and will not be able to be traced or identified by the researcher. The discussion is expected to last approximately one hour, and we will provide you with a meal. There will also be door prizes for participants.

So that every focus group participant can contribute to the discussion, it is important that no more than 20 individuals participate. So that we can best accommodate you, we have developed the following registration procedures:

- 1). To register for **EITHER** of the two sessions, please return the enclosed registration card.
- 2). We only need to track the number of participants; **we do not want to know your name**. So, in order to preserve your anonymity, I am asking that you **make up** a numerical identity for yourself—using any six digit number (e.g. 002341; 143875 etc), and register for one of the two groups scheduled. Please keep track of the number you use to register.
- 3). To register, please check the session that you are registering for, using your made up name, and the year you entered Drexel —(eg. 002342--1998)

4). We will record the reservations in the order they are received

5). If more than 20 people register for either of the two groups, we will e-mail all of you, and **using the made up numbers you identified yourselves with**, request that specified participants register for an additional focus group that we will develop for that city. We are also requesting that you identify the year you entered Drexel so that we can document the representation of each cohort in the study.

If you have any questions regarding the study, or would like more information, please contact the Office of Institutional Research at 215-895-1635.

Sincerely,

Drexel University

Enclosures:



Drexel University Vanguard Study

Yes, I would like to participate in a Vanguard focus group (**PLEASE CHECK ONLY ONE**):

_____ **PHILADELPHIA**

Date: Tuesday, March 9, 2004

Address: Room 2019-2020

MacAlister Hall

Drexel University

3201 Chestnut Street

Philadelphia, PA 19104

Time: 6:00 p.m.

_____ **HOUSTON**

Date: Saturday, March 13, 2004

Address: YES College Prep

353 Crenshaw

Houston, TX 77034

Time: 11:30 a.m.

MADE UP NUMERICAL CODE: _____

Year you entered Drexel _____

Please return to:

Drexel University
Philadelphia, PA 19104

Appendix E: Focus group Protocols



Office of Institutional Research

Drexel University Vanguard Study

Interview Protocol

3/09/04 -3/13/04

Good Afternoon. Thank you for agreeing to participate in this focus group. My name is _____ and I have been asked to facilitate a discussion among individuals who enrolled in Drexel University as Vanguard Scholars between 1996 and 2003.

Does every person in the room meet that criterion? (If yes, proceed to question 1) (If no, thank the persons who do NOT meet the criterion, and excuse them). This focus group is expected to last for approximately 1 hour. Please feel free to get more food and drink at any time during our discussion.

The purpose of this focus group is to learn more about how your selection as a Vanguard Scholar at Drexel University has impacted your ability to attend college, your career plans, and your beliefs about yourself and your potential. Please be assured that anything that you say within this room will be held in the strictest confidence, and that you will not be able to be identified. Although I am recording your comments, they will be reported

anonymously. For purposes of identification, I have placed a card in front of each of you with a letter. Your comments will be identified only by letter in the transcript of this session.

I will ask a series of questions, and will ask you to respond. I will identify each of you by letter before your response. Although the questions will ask for a specific response, please feel free to elaborate on a response given by another individual if that appears to be appropriate.

1. How important was the Vanguard Scholarship in your decision to attend college, and Drexel University, in particular?
2. Are there any particular personality factors that you think are shared by Vanguard Scholars?
3. Tell us about your educational experiences before coming to college. How well did your high school prepare you for college?
4. As you know, the Vanguard program is both a scholarship and a student support program. Are both aspects important, or could the program function equally well as either financial aid alone, or as a student support program alone?
5. Thinking about the university support programs that are/were available to you, what were most important in contributing to your success? Summer Immersion, relationships with faculty and staff, Vanguard housing, peer mentoring, undergraduate research opportunities, tutoring and SUCCESS services?

6. How supportive do you feel the University is to African American and Hispanic students? Does/did your participation as a Vanguard Scholar help create a better learning environment for you?
7. What do you think the University should do to improve the retention of African American, Hispanic and American Indian students?
8. Did you ever seriously think about dropping out? If so, how did being a Vanguard Scholar influence your decision?
9. When things have gotten tough, or did get tough, to whom did you turn for support and advice?
10. How have you changed as a result of being a Vanguard Scholar? Have your personal and career plans changed from when you entered college?
11. If you could improve the Vanguard program in any way, what would you do?
12. Is there anything else we should know about the Vanguard program and its impact on your college career?

We have 3 door prizes: 1) Drexel key chain 2) Drexel chocolates and 3) Drexel t-shirt
Please take a pair of cards. Keep one and put the matching card in the brown envelope. Draw card and award prizes.

Thank you for participating. Your responses have been very important to the university and will help Drexel University improve student services.

Appendix F: Non-Cognitive Questionnaire (NCQ)

APPENDIX G: Coding Instructions for the Non-Cognitive Questionnaire (NCQ)

APPENDIX H: NCQ Factor Norms for Blacks Using Scoring Key

NCQ FACTOR NORMS FOR BLACKS, USING SCORING KEY*

Notes: Blacks (N = 442); see Tracey and Sedlacek (1984, 1985).

T score equivalents; T scores have a mean of 50 and a standard deviation of 10. Enter the table with a raw score and determine the T score equivalent, or vice-versa.

Raw Score	Factor 1 (Self-Concept)	Factor 2 (Realistic Self-Appraisal)	Factor 3 (Understands Racism)	Factor 4 (Long-Range Goals)	Factor 5 (Support)	Factor 6 (Leadership)	Factor 7 (Community Service)	Factor 8 (Knowledge Acquired)
2							19	37
3				12		18	28	48
4		19		18		24	37	59
5		25		23	3	30	45	70
6		31		29	8	36	54	80
7		37		35	14	42	62	
8	4	43		41	20	48	71	
9	8	49	4	47	25	53		
10	12	54	8	51	31	59		
11	17	60	13	58	36	65		
12	21	66	18	64	42	71		
13	25	72	22	70	47	77		
14	29	78	27		53			
15	33		31		59			
16	37		36					
19	49		50					
20	53		54					
21	57		59					
22	61		63					
23	65		68					
24	70		73					
25	74		77					
26	78							

* Table taken from Sedlacek, W.E. (2004), p.177.

Vita

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Place of Birth: Worcester, Massachusetts

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Education:

Years Attended	Institution	Degrees Awarded
1962-1966	Emmanuel College Boston, Massachusetts	B.A. English
1966-1967	Emmanuel College Boston, Massachusetts	B.A. Sociology
1967-1969	Northwestern University Evanston, Illinois	M.A. Sociology
1974-1978	Temple University Philadelphia, Pennsylvania	M.S.W. Social Work Administration
1990	Columbia University Graduate School of Business New York, New York	Certificate: Not-For Profit Mgmt.
2000-2004	Drexel University Philadelphia, Pennsylvania	Ph.D. Educational Leadership Development and Learning Technologies